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VOLUME XCIII NUMBER ONE

THE NATIONAL GEOGRAPHIC MAGAZINE

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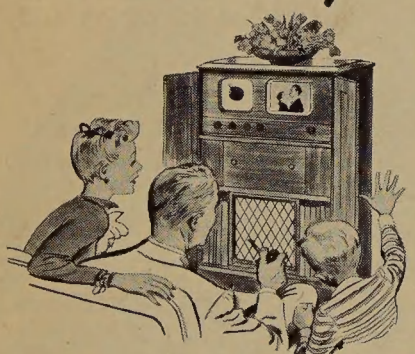

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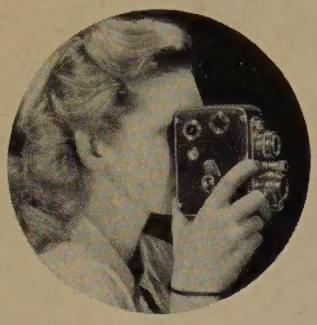

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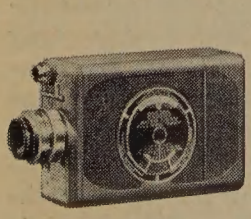

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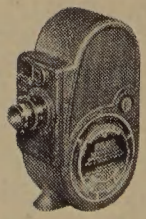

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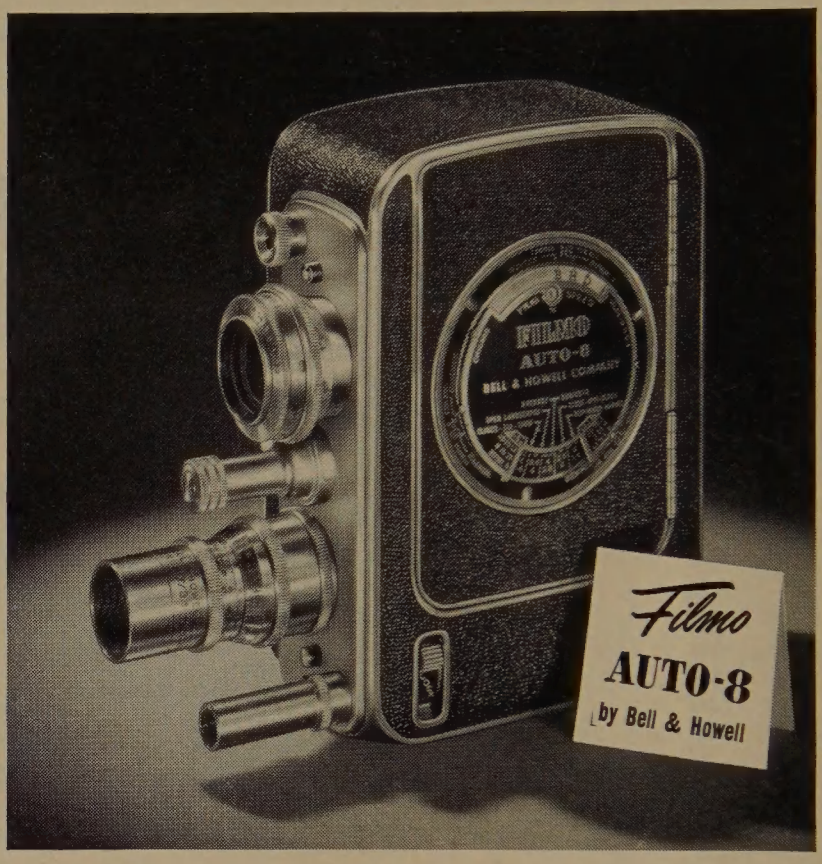

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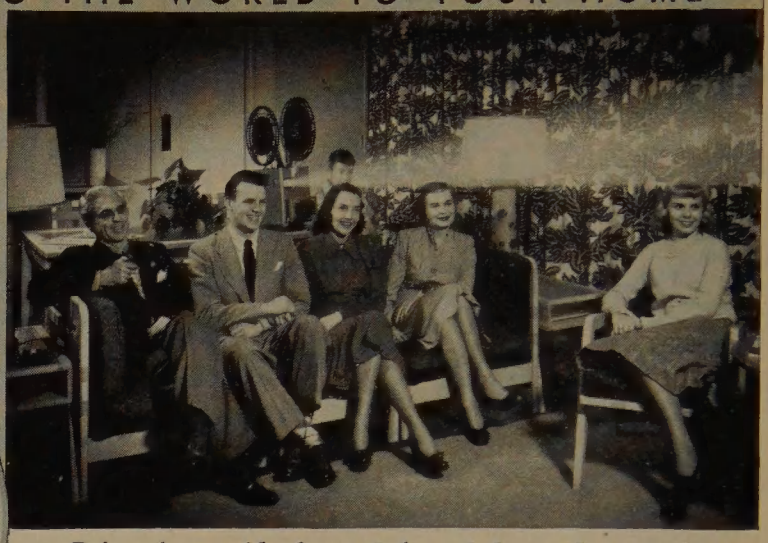

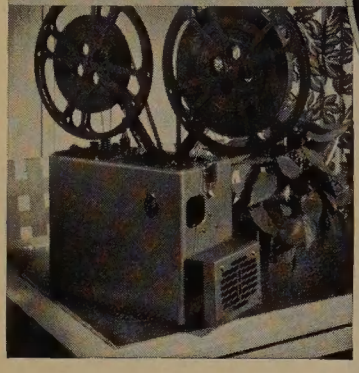

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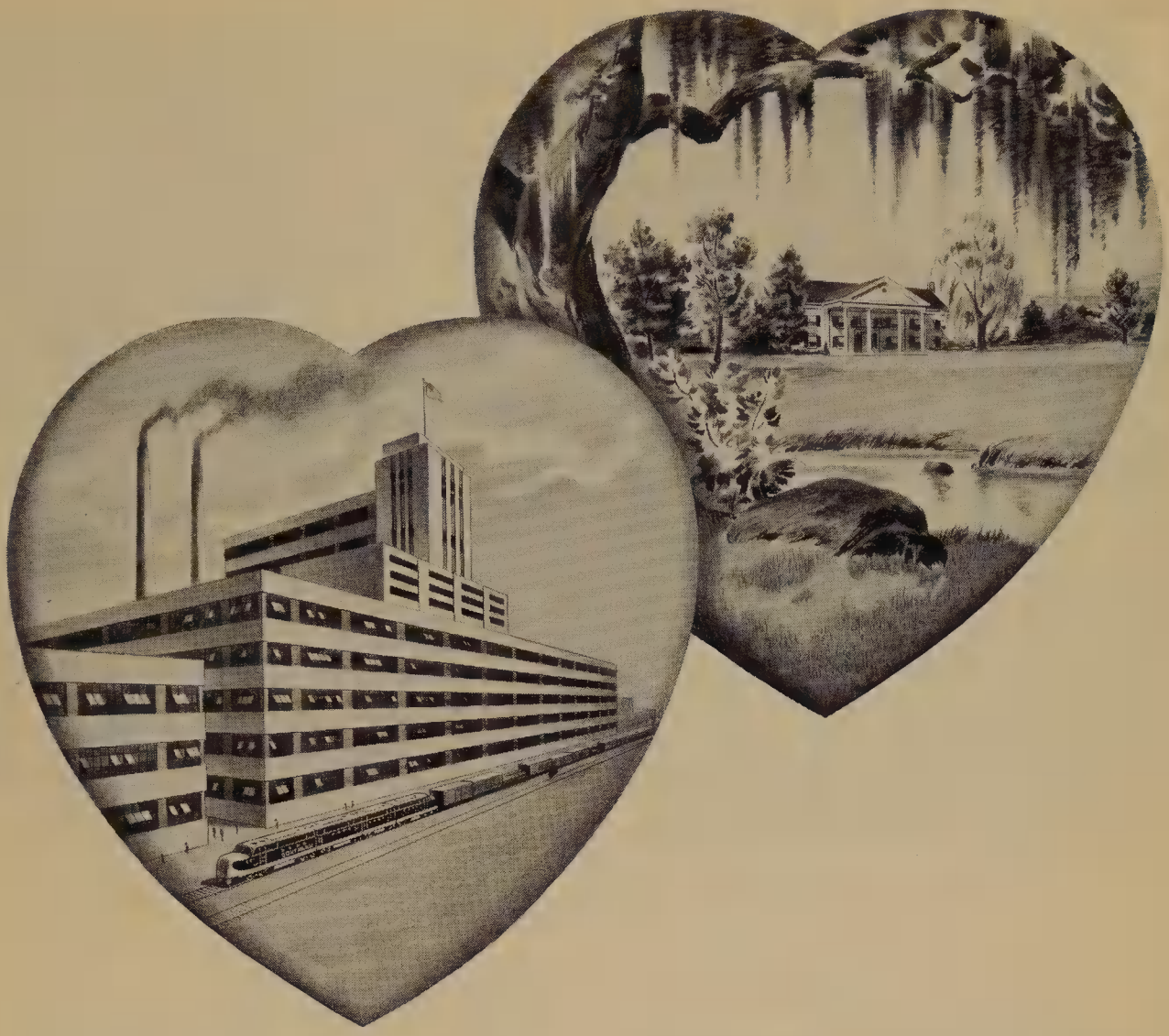

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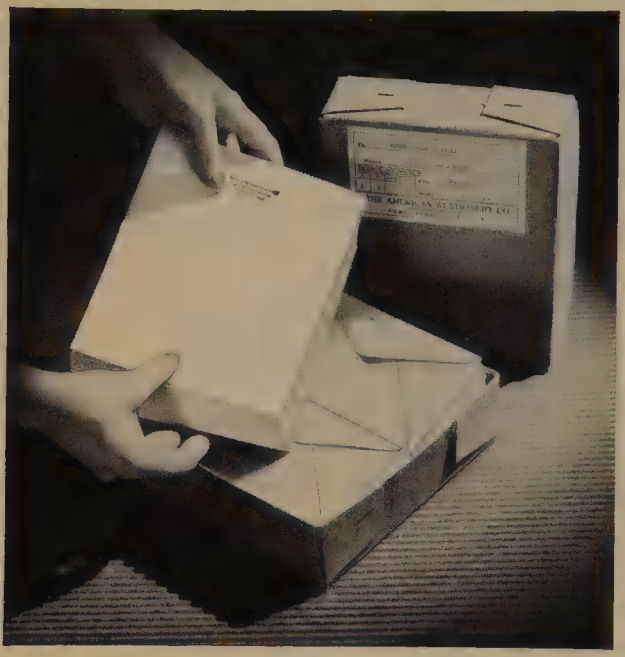

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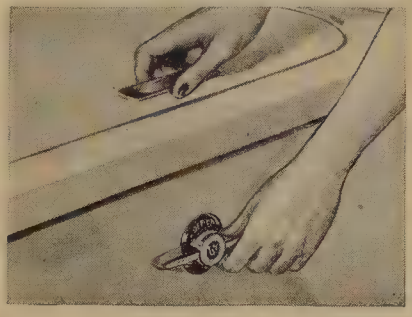
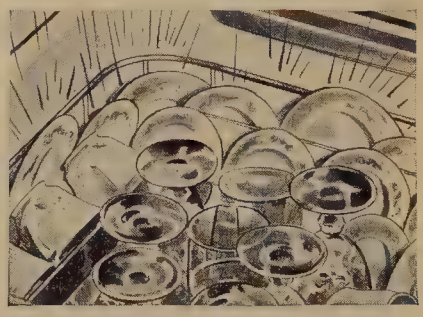


2. Now add detergent (not soap), close cover and turn switch. Dishwasher is now at work, scouring each piece shining clean. Your job is done; you're free to do whatever you wish.

3. While you do as you like, each piece is thoroughly cleaned and scoured by the hot water and detergent. Only the water moves—*not* the dishes. They stay firmly in the racks. Then . . .



4. Automatically, water drains out. Automatically—dishes get *two* rinses in clear, steaming hot water. They are now *hygienically* clean . . . cleaner than you could get them by hand!

5. Automatically, the second rinse water has drained out, the lid pops open letting both dishes and Dishwasher dry in their own heat! Yes, the job is done—perfectly—in the time it takes to do your nails.

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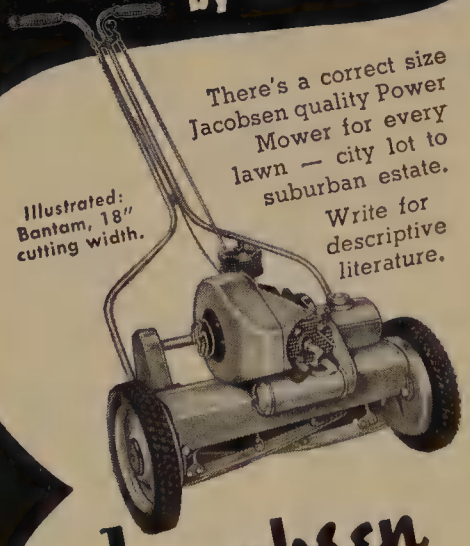

Illustrated: Bantam, 18" cutting width.

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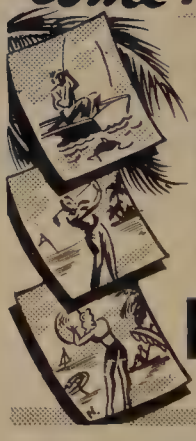

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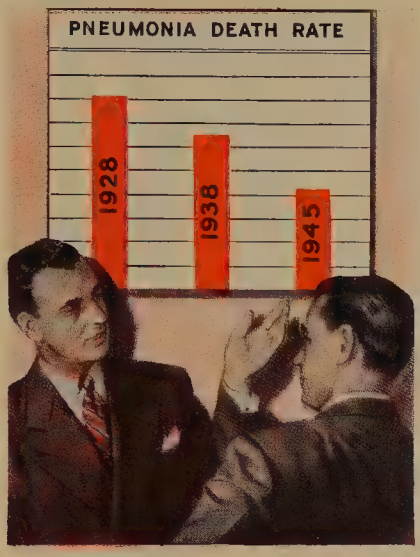
WHAT SCIENCE IS DOING



1. Before 1930, pneumonia stood among the first three causes of death. Once the disease struck, careful nursing and the use of oxygen were about the only ways of fighting it. The death rate was about 83 per 100,000.

2. From 1930 to 1938, *serum treatment* was started and developed. This involved, first, laboratory analysis to determine the particular type of disease and, second, administering a serum known to combat the disease if it were one of certain types. Pneumonia's death rate dropped, and in 1938 was about 67 per 100,000.

3. From 1938 on, modern medical science has scored one of its most dramatic successes. First the sulfa drugs, then penicillin and streptomycin have proved effective in combatting many types of pneumonia. While the death rate from pneumonia had been reduced to less than 40 per 100,000 in 1946, this disease is still a frequent cause of death.

WHAT YOU CAN DO

1. Try to avoid catching a cold. If you keep your general level of health high, especially during the "pneumonia months" of January, February, and March, you won't be as susceptible to colds or pneumonia.

Be careful to dress warmly when you go out, and try to avoid people who cough or sneeze carelessly. It is estimated that 9 out of 10 pneumonia cases start with a cold.

2. If you get a cold—take care of it! You will protect yourself from possible pneumonia, and you'll protect others from your infection. Stay home and rest if you can.

If you must go out, keep warm and dry. Eat lightly, and drink plenty of fruit juices and other liquids. When your children have colds, keep them at home to protect their health and that of their classmates.

3. If your cold hangs on, or if your temperature goes up, or if any other unusual symptoms appear, go to bed and *call your doctor at once!*

It may be only a severe cold, but if it should be pneumonia, or influenza, or some other illness that starts like a cold, your best chance for a rapid recovery will come from prompt diagnosis and immediate medical and nursing care.

To learn more about how you can guard against colds, pneumonia, and influenza, send for Metropolitan's free booklet N-18, "Respiratory Diseases."

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Why Balistes gets a lettin' alone

THE Caribbean trigger fish (*Balistes vetula*) would end up in the stomach of a shark far oftener than he does, except for one thing.

Instead of a dorsal fin, Balistes has a heavy, sharp spine just behind his head. Normally this spine lies in a shallow groove along the back.

But when Balistes sees a shark or other large predatory fish coming his way, his sharp spine pops up and is locked in place. His enemies then recognize Balistes as a fish hard to swallow or, at best, a pain in the gullet. And they leave him alone.

Man has gone Balistes and nature one better. Not only has he developed countless weapons to fend off trouble, he has even figured out a device to keep unavoidable mishaps from costing him a lot of money and worry.

The name of that device is insurance. Think of the worries that insurance saves you.

An accident may lay you up. But if you have accident insurance, you won't have to dip into savings to pay your bills while you're not earning.

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Particularly if you have young children, you need to know about Travelers Triple Protection. This policy pays three times its face value the first 20 years it's in force. And that's when a man with a family needs the most protection.

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VOL. XCIII, No. 1 WASHINGTON JANUARY, 1948

THE NATIONAL GEOGRAPHIC MAGAZINE

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Carib Cruises the West Indies

By Carleton Mitchell

With Illustrations from Photographs by the Author

IT IS pleasant to have a dream come true, with reality more pleasant than the dream. During all the years I had been sailing, a favorite occupation from the time when small neighbors were shooting marbles, I had thought of a cruise through the islands of the Caribbean.

Whenever I came across a chart of the area I would run a finger along the dots that curve north from the shoulder of South America like a person admiring the pearls of a beautiful necklace. I could suddenly see a wake lying white against the blue water astern, feel hot sun and cooling trade wind on bare shoulders, and over the bowsprit visualize green palms and shadowed mountains.*

Sailing in the Wake of Columbus

At 4:40 on the afternoon of February 9, 1947, the dream began to come true. We dropped our lines at Port of Spain, Trinidad, and set sail for Annapolis, Maryland, nearly 3,000 miles away (map, page 5).

As we streamed the log off the Dragon's Tooth in the Boca de Monos, the narrowest and most easterly of the exits from the Gulf of Paria, *Carib* lifted to ocean swells. Here, according to the *New Sailing Directions for the Caribbee Islands,* published in 1818, was such "a perpetual agitation of the sea" that Columbus "called these passages *Bocas del Drago,* or Dragon's Mouths."

Conditions haven't changed. A mouth of the Orinoco River still drains a jungle rainfall into the Gulf, which discharges through the Bocas to meet the westerly current set up by the Northeast Trades. The collision of the two currents begets a steep, cresting sea.

"Just wait until you hit that sea off the Bocas," Trinidad friends had said. "You'll find the going really rough."

It wasn't exactly smooth. Still, for a husky cruising yacht it was only moderately uncomfortable. Soon we could distinguish the row of smaller islands which run like stepping-stones to the mainland and mountains of Venezuela. To me Trinidad seemed just a chip off South America, separated by narrow passages.

Months of planning and work lay behind. In the fall of 1946 my wife and I had decided to send *Carib* to Trinidad on the deck of a steamer. We had lived afloat almost constantly for a year and wanted a spell at home.

Also, the trip to the Windward Islands in winter is not easy. One must make a long sea passage north of 30 degrees latitude to gain easting with the help of westerly winds, or thrash to windward against the adverse Trades along the coasts of Haiti and Puerto Rico.

Most important, reducing our sailing distance by half gave us time for leisurely exploration of the islands.

Neither *Carib* nor ourselves were new to West Indian waters. Before the war I had made several long cruises through the Bahamas and Greater Antilles. The previous winter we spent five months circumnavigating Nassau the long way. Sailing southeast through the Bahamas to Haiti, we crossed to Jamaica, ran to Habana by way of the Caymans, the Isle of Pines, and the Yucatan Channel, and finally returned to Nassau via

* See "Southward Ho! in the 'Alice'," by Henry Howard, in the National Geographic Magazine, March, 1938, and "Westward Bound in the *Yankee,*" by Irving and Electra Johnson, January, 1942.

Carib Sails In Close and Salutes "H. M. S. Diamond Rock"

Here in 1804 Commodore Sir Samuel Hood "marooned" 120 British sailors. Hanging in clusters on the almost perpendicular slopes, they pulled up five cannon by hawsers—a sight which reminded a shipboard witness of mice hauling up a little sausage. For nearly 17 months the little band harassed blockade runners out of Martinique (background). As supplies approached exhaustion, the French attacked. With their last ammunition the defenders sank three gunboats, then surrendered with military honors. Unsinkable but immobile, the island is often called "H. M. S. Diamond Rock," as if it were a ship. British naval vessels always salute it on passing (page 9).

the Gulf Stream and Northwest Providence Channel.

Only Al Nelson, our professional, lacked offshore experience, but I had no misgivings about him—a confidence well justified, for he turned out to be an ideal shipmate.

Carib Named for West Indies' First Citizens

Our boat was named for the Indian tribe which dominated these islands, a warlike people who chose extermination to subjugation. Early books called them the Caribe Indians, or Caribbees; thence the Sea of the Caribbees, becoming Caribbean Sea.

Carib was built in 1939 as _Malabar XII_, the personal boat of John Alden of Boston, the dean of American yacht designers. She is a jib-headed ketch, 46′8″ overall, 34′6″ on the waterline, has a beam of 12 feet and a draft of 7′4″. I had purchased her in the fall of 1944 while I was still in the Navy. Naming her for the Caribbean proved that my dream of sailing tropic seas never faded.

After V-J Day she was readied for a long cruise: new running and standing rigging, hand-sewn sails, swing table, bunkboards, watertight covers—the list was long and expensive. But ocean cruising is only dangerous to unsuitable boats and poor equipment, sailed by an inexperienced crew. Size is a minor factor in safety: the lifeboat survives after the steamer has foundered.

As we plunged into the seas off the Bocas, I gave thanks to the United States Navy.

Had it not been for Capt. John B. Griggs, Jr., USN, Commander of the Naval Operating Base, it would have been difficult to rig the boat in Trinidad.

We were towed into a slip at Chaguaramas Bay to lie dwarfed by a floating drydock capable of repairing a cruiser while divers removed our cradle and derricks lifted the masts into position.

Trade Winds Blow True and Fair

The distance from Trinidad to Grenada is 90 miles, so we made an afternoon start in order to make a daylight landfall. All sailing in the West Indies is governed by the Trade Wind, which is practically always from the easterly quadrant; that is, somewhere between northeast and southeast.

We were lucky. The wind was due east, putting it nearly on the beam. *Carib* tossed her head with pleasure.

It is hard for a sailor to believe that a boat is an insensate thing of wood and metal: you come to believe that it has moods, personality, and even a mind of its own. On this passage *Carib's* spirit matched mine. Carrying full sail we boiled through the night, slamming into the seas to throw sheets of warm spray which glittered in the moonlight.

The powerful light on Chacachacare Island had hardly disappeared astern before we sighted the light on Saline Point, Grenada. At 4:40 in the morning, just twelve hours out, we hove to off St. George's Harbour to await daylight. We had made a fine passage. Distances between the islands are short; this was to be our last night run for three months.

Should your dream be the same as mine—and I really believe that to sail a small boat to tropic isles is the most common of human dreams—I can only wish you an introductory landfall identical to ours.

The morning sun first silhouetted, then gradually illuminated, Grenada, a golden light creeping up the mountainsides. Beyond water of an incredible blue lay white beaches and waving palms.

As we rounded a point guarded by a weathered fortress, the town sprawled around a semicircle of hills, looking like a stage set (Plate VI). Even today I feel that Grenada is the most beautiful of the Caribbees.

This has been called the "Spice Island." Quantities of cocoa and nutmeg are grown here. The air is frequently scented by cocoa beans drying in the sun (Plate VII). A planter told us of an amusing letter received from his agent in London: "Send us more mace and don't bother to grow so much nutmeg" it read—but mace is a fibrous tissue which covers the outer shell of the nutmeg!

Most of the island is fertile, the hillsides and valleys covered with thick vegetation.

There is one exception, Saline Point, a flat peninsula to the southwest. The umbrella of clouds that usually hangs over the peaks of the Windward Islands skips this corner. Its annual rainfall is but 30 inches, compared with 70 inches for the town of St. George's. In 1946 Belvidere, only a few miles away, had an unusual rainfall of 156 inches.

Approaching Saline Point, our car, after passing lush greens, emerged from a rain curtain into a parched brown semi-desert (Plate V).

An excellent road belts the island. One day we drove to the town of Sauteurs to lunch with the Rev. Father Brian Proudman, the parish priest. During the war he had been an "aerial bishop," Royal Air Force slang for chaplain. Before his church lay a burial ground whose tombstone inscriptions date back 200 years. From the bluff could be seen the smaller islands of the Grenadines, purple outlines on the blue water (page 6).

As we looked out, Father Proudman said: "This spot is called Le Morne des Sauteurs or 'Caribs' Leap.' In early days the island was in the possession of the French, who systematically slaughtered the Indians. The last remnants retreated here and held out for some time. Finally, the legend goes, the French discovered an unguarded path through a swamp; as they closed in, the Carib warriors threw their women and children over this cliff, then leaped after them."

Carnival in Grenada

We were fortunate to be in Grenada for Carnival, the big event of the year in the Windward Islands. Weeks of preparation culminate in The Day. Even before dawn bands begin to parade the streets, maskers falling in behind. In the afternoon the entire population of the island congregates at the race track near St. George's, and prizes are awarded maskers and musicians.

At the time of our visit a queen had been elected by popular vote; this year a king will be selected. Each may choose a consort. The costumes of the royal court were elaborate, and the monarchs presided with great poise and dignity (Plates X, XI).

In the selection of carnival dress, Grenadans let their imagination run wild. Costumes ranged from grotesque homemade masks and sackcloth capes to colorful dresses symbolizing the latest achievements of distant scientists, such as "Miss Plastic Cooker" (Plate IX, right).

White Sails and Ebon Sailors Carry on the West Indies' Interisland Trade

These two, part of a crew of five, man the sloop *Concorda,* out of St. Thomas, Virgin Islands. They and their fellows, trained in the Virgins' reefs and currents, are the peers of any seamen in the Indies, one of commercial sail's last strongholds. The author found their tiny vessel laden with 14,000 coconuts. The uncovered box lined with tin is the stove; a tiny charcoal fire is kept lighted in it, when weather permits.

Local merchants, knowing a pretty girl attracts attention, outfit attractive models with costumes that advertise their product. Prizes are awarded to the best "sandwich girls" (Plate IX, left).

"You'll catch it when you hit the sea off Kick 'em Jenny," Grenada friends told us. "It may be Diamond Islet on the chart, but you'll soon find why it reminds local sailors of a mule. Why, the last time we went by we had to shift into low gear and go down the waves on compression!"

So, as we powered with limp sails along the lee or western coast of Grenada, we expected the worst. Clear of David Point the breeze was no longer blanketed by the mountains, and we thankfully turned off the engine. Less than two hours later we swept by Kick 'em Jenny at seven knots, decks nearly dry, while Zib, my wife and our genius of the galley, served a hot lunch.

When *Carib* is under way in the open sea, cooking can go on in her little galley even when she "stands on her ear," as sailors describe a sharp angle of heel. The two-burner alcohol stove, hung on gimbals, swings freely so that as the ship rolls it remains comparatively stationary.

Though not a drop will spill, it takes a cook with "sea legs" to watch the pots when the motion is wild. Only twice during the whole passage did Zib find it too rough to cook.

Drawn by Theodora Price and Irvin E. Alleman

***Carib's* Route—3,000 Miles of Breeze and Adventure**

The Caribbean! Maps can only hint at its fabulous discovery voyages, Indian wars, slave settlements, pirate raids, and naval battles. The author, sailing his ketch into obscure, volcano-sheltered harbors, visited the birthplaces of legends and captured little-known fragments of romance. How *Carib* toured the West Indies is shown in fuller detail by the map on page 7.

Oysters Grow on Trees in Carriacou

In midafternoon we dropped our anchor off the dock at Hillsborough, Carriacou, to lie perfectly protected in a lovely curving bay. The sails were barely furled when a boat came alongside to deposit a huge sack on our deck. "Compliments of Mr. Knight, the Commissioner," grinned the constable in the stern. "Mr. Comissiong in St. George's wired you were coming."

"What's in the sack?" I inquired.

"Oysters," he replied. "Oysters that grow on trees."

Next day we gathered some ourselves from the roots of mangrove trees that line a cove off Tyrrel Bay (Plate XIII). Although the oysters were small, the flavor was superb.

The Grenadines, about 100 islands and rocks, form a chain that extends some sixty miles between Grenada and St. Vincent. In

Grenada's Dead Rest Beside the Seaside Cliff Where Indians Committed Suicide 300 Years Ago

Rather than surrender to the pursuing French, the Carib warriors threw their women and children over and then jumped to their death from "Caribs' Leap," Le Morne des Sauteurs, in 1650. The Reverend Father Brian Proudman, a wartime "aerial bishop" with the RAF, looks over the scene (page 3).

spite of their charm they are rarely visited. A cruiser could enjoyably spend a winter exploring them, while the fishing and swimming are unsurpassed. From Carriacou we proceeded to Little Martinique, Little St. Vincent, Mayero, and Bequia. On the last, many trading schooners are built along the shore of Elizabeth Town, proud that it bears the name of the present British princess.

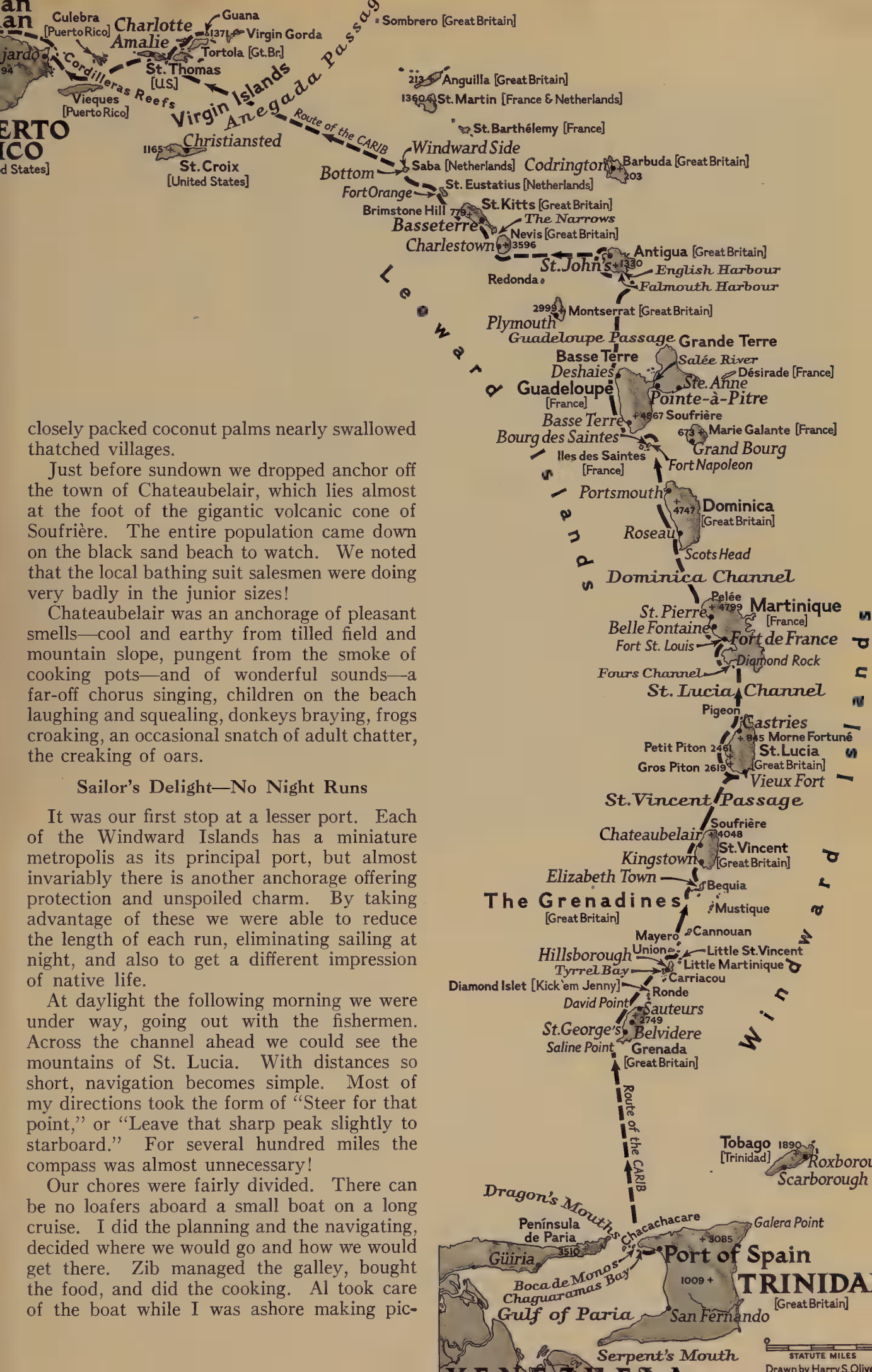
"Wait until you hit the sea in the Bequia channel," ran the refrain. Although the Anglican parson accompanied us and defied sailor superstitions by whistling, we were swinging at anchor in Kingstown, St. Vincent, in less than two hours.

We found we had sailed over waters which hide an unsolved mystery of the sea. Alan Gunn, Kingstown yachtsman, related the story as he showed us the sights of the island.

"The Diesel schooner *Island Queen* left Grenada with nearly 60 passengers and 11 crew, coming here on an excursion," he related. "She was nearly new—only two or three years old. During part of the run another schooner was within sight.

"Then somehow she disappeared. Completely disappeared. Not a trace was ever found: no wreckage, no bodies—nothing! It happened in 1944 when the U boats had almost stopped prowling; but a torpedoed vessel leaves floating debris, and someone in the Grenadines would have seen the flames or heard an explosion. In this case the schooner and everyone aboard just vanished."

From Kingstown we followed the west coast of St. Vincent, looking into valleys whose



closely packed coconut palms nearly swallowed thatched villages.

Just before sundown we dropped anchor off the town of Chateaubelair, which lies almost at the foot of the gigantic volcanic cone of Soufrière. The entire population came down on the black sand beach to watch. We noted that the local bathing suit salesmen were doing very badly in the junior sizes!

Chateaubelair was an anchorage of pleasant smells—cool and earthy from tilled field and mountain slope, pungent from the smoke of cooking pots—and of wonderful sounds—a far-off chorus singing, children on the beach laughing and squealing, donkeys braying, frogs croaking, an occasional snatch of adult chatter, the creaking of oars.

Sailor's Delight—No Night Runs

It was our first stop at a lesser port. Each of the Windward Islands has a miniature metropolis as its principal port, but almost invariably there is another anchorage offering protection and unspoiled charm. By taking advantage of these we were able to reduce the length of each run, eliminating sailing at night, and also to get a different impression of native life.

At daylight the following morning we were under way, going out with the fishermen. Across the channel ahead we could see the mountains of St. Lucia. With distances so short, navigation becomes simple. Most of my directions took the form of "Steer for that point," or "Leave that sharp peak slightly to starboard." For several hundred miles the compass was almost unnecessary!

Our chores were fairly divided. There can be no loafers aboard a small boat on a long cruise. I did the planning and the navigating, decided where we would go and how we would get there. Zib managed the galley, bought the food, and did the cooking. Al took care of the boat while I was ashore making pic-

Bottle and Goblet, Twisted Mementos of Pelée's Fires

St. Pierre's Volcanological Museum preserves these and other relics of the 1902 eruption. Iron nails are melted into an ingot. Books show every page charred. An electric bulb, fused into other objects, still lights (page 14).

tures, arranged for services, and did nearly all the maintenance.

We had no scheduled watches, but all took turns at the helm; the three of us had sailed together so much that orders were unnecessary. Usually Al and I were able to do the deck work alone, one at the wheel and the other handling the sails, but when it blew hard Zib took the wheel so that the two of us could wrestle with the canvas.

After a night at Vieux Fort, the most easterly point of the cruise, we slid along the leeward coast of St. Lucia to be awed by the Gros and Petit Pitons, among the most spectacular sights of the world (Plate XV).

St. Lucia has been called "The Fair Helen of the West Indies." Certainly few objectives in history have occasioned bitterer struggles. Six times in the possession of the French since 1760, seven times retaken by the British!

Towering over landlocked Castries harbor is the Morne Fortuné, whose ramparts were the key to the entire West Indies. Its slopes ran red with French and English blood.

But today the jungle encroaches on its cemetery, and the imposing buildings on its crest crumble in ruin (page 10).

On several afternoons, sitting with friends, we looked out over a tranquil plateau dotted with grazing sheep and playing children. I thought of that 24th of May, 1796, when the Royal Inniskilling Fusiliers stormed and took the Morne Fortuné in the face of bitter French opposition.

So gallant was the regiment's conduct that Sir Ralph Abercromby, the British commander, ordered the regiment's own flag flown for one hour before the hoisting of British colors.

Near by is Pigeon Island, the site of Rodney's lookout during the blockade of the French fleet in Martinique. There I had my worst moments of the cruise: to reach the island I rented a native canoe.

From the first I noticed the boat was leaking, but assumed it was not too bad. Soon water was swirling around my ankles, and wooden objects were afloat in the bilge. One boy stopped rowing and began to bail in leisurely fashion. Suddenly it dawned that the water would sink us within minutes—and three precious cameras aboard!

Wedging camera bags on the seat, I knelt on the bottom and frantically scooped water with both hands while yelling at the two boys.

We crossed the channel throwing water like a fire tug while the one oarsman set a pace that would have won him a scull championship!

Carib Salutes Diamond Rock

From Rodney's lookout tower I could plainly see famous Diamond Rock and the shore line of Martinique; less than twenty-four hours later we were approaching these landmarks in *Carib* (page 2).

Diamond Rock was the scene of one of the British Navy's greatest feats; its sailors have long called it "H.M.S. Diamond Rock." The British, under the command of Admiral Hood in 1804, found French ships were escaping through Fours Channel, which lies between the rock and the southwest tip of Martinique. So, one fine day, the Admiral laid his frigate, *Centaur,* alongside and sent five cannon and 120 men to the summit!

From their vantage point the brave group, under the leadership of Lt. James Maurice, R. N., made the French extremely uncomfortable for nearly 17 months!

In memory of those British sailors who hauled their cannon, ammunition, food, and even water up that steep precipice, British naval vessels still salute "H.M.S. Diamond Rock." The *Carib,* too, dipped her colors as she rounded the rock into Fours Channel.

We had heard many conflicting stories concerning the French islands. At the Embassy in Washington wartime restrictions were still in effect, and our passports had been visaed with the proviso that we would eat and sleep aboard our boat. With some uncertainty we warped our stern into the yacht-club dock at Fort de France.

St. Pierre, Reborn, Rises from Her Ashes

On May 8, 1902, a whirlwind of fire from exploding Mount Pelée snuffed out the lives of some 40,000 people in the Martinique port—every witness, in fact, except one criminal in jail and a few sailors on a ship. With this hopeful statue, the new St. Pierre challenges Pelée to do its worst (Plate XVIII).

We were not long in doubt. A crowd on shore offered advice and assistance, and *Carib* was soon boarded by two representatives of the club. "Welcome to Martinique," said one. "Please use this club as your home. Let us know if there is anything we can do."

A second later a man spoke to us from the dock. "Good afternoon," he said. "My name is Legros. Edgard du Prey cabled from New York to tell me you were coming. Will you and Mrs. Mitchell dine with me tonight?"

And so it began—the wonderful hospitality of Martinique. Nowhere have I encountered such friendliness and genuine desire to make the stranger welcome.

Our days on the island blur into one happy

Picture of Peace, St. Lucia Is the "Island of Strife." Castries Harbor Changed Hands a Dozen Times in French-British Wars

In 1942 a U-boat skipper, becoming impatient over two ships delaying their scheduled departure, sneaked into the harbor and torpedoed them; then he boldly surfaced and put out to sea. In 1778 some 1,300 Britons entrenched in the hills beat off three desperate charges by 5,000 French troops. From Pigeon Island, one of the distant peaks, Rodney kept watch on the French fleet in Martinique. *Carib* (left) and the yacht *Heloise* rest beyond the big freighter.

One Glance Suggests a Teeming Canal Town in Java, but Fort de France Is the Little Paris of the New World

In the capital of Martinique even the darker citizens have a Gallic manner. The city cannot forget that Josephine, one of its daughters, became the wife of Napoleon and Empress of France. A statue honors her memory. This is the Madame River, whose companion is, logically, the Monsieur River.

Al Nelson

"Laying Mash" and "Turkey Finisher" Shirts Are *Carib's* Souvenirs of Haiti

Flour and feed sacks command a good price all over the West Indies, for they can be made into garments. The skipper (left) and Henry Rigg bought theirs in the native market of Cap Haïtien.

recollection of places and people: dinner with the Garcins, where we laughed at our attempts with each other's language; lunch with Madame Clement at "Acajou," a two-century-old plantation house overlooking the family rum distillery; and a picnic high on the side of Mount Pelée with the Legros family, where our admiration was divided between the scenery and the flow of wonderful food from wicker hampers.

Hearn's Martinique of 60 Years Ago

One scorching noon in Fort de France the girls working at the Credit Martiniquais gave up their lunch hour to don traditional costumes and promenade in Alivon's garden. From old chests came forth beautiful dresses and jewelry to recreate a scene from the late eighties. Lafcadio Hearn's lines in *Two Years in the French West Indies* might have described the very girls I was photographing (Plate XVII).

"Fantastic, astonishing—a population (out) of the Arabian Nights," he wrote. "Perhaps the most novel impression of all is that produced by the . . . brilliancy of the women's costumes. Some of these fashions suggest the Orient: they offer beautiful audacities of color contrast. The full-dress coiffure is most striking. It is an immense Madras handkerchief, which is folded about the head with admirable art, like a turban, one bright end being left sticking up like a plume. This turban, always full of bright canary-color, is fastened with golden brooches.

"The dress is simple enough—an embroidered chemise with sleeves; a skirt or jupe, very long behind, but caught up and fastened in front and, finally, a foulard or silken kerchief, thrown over the shoulders. These are exquisite in pattern and color—bright crimson, yellow, blue, green, lilac, violet, rose—which vary astonishingly."*

The island was hard hit by the war. There

* See "Lafcadio Hearn on the Island and People of Martinique," National Geographic Magazine, January, 1902.

Mother and Baby Tour St. Kitts Three Days after a Fuzzy Advent

Patient donkeys, beloved by children, do a large share of the West Indies' work. This mother wears a cradle for carrying sugar cane. Chaff from harvested stalks litters the field.

was a tragic political division, and our naval blockade imposed real hardship. Today trade has been largely reestablished, and prosperity is returning; there are few shortages, but prices are high and the black market flourishes despite rigid currency controls.

In the early days of the war the French aircraft carrier *Béarn,* stationed in Martinique, was a source of concern.* Adm. Georges Robert, in charge of the military forces on the island, chose to follow the orders of the Vichy regime, and many United States officials were perturbed by this loophole in hemisphere defense.

A huge majority of the citizens, however, were not in sympathy with Vichy, and many young men made the hazardous passage across to St. Lucia in anything that would float to join the Allied forces.

I saw evidence of the bitter rift that existed in Fort de France. In the office of Mr. Emmanuel Rimbaud hangs a framed copy of an order dated June 24, 1943, and signed by a Robert minion, which commits him to jail for being "dangerous to the national defense and public security."

The room was the secret meeting place for members of the Resistance, and its walls are covered with mementos. One is a flag, torn down and trampled in the garden on the day he was jailed, which was triumphantly hoisted and kissed by 10,000 when he was freed.

Many remember Martinique as the birthplace of the Empress Josephine, wife of Napoleon. A contemporary of hers, the Sultana of Turkey, was also born there. History has few stranger stories than these two women of humble origin following their destiny from this tiny island to two of the most brilliant courts of the world.

We were able to leave only by convincing ourselves that someday we would return. Finally *Carib* slipped her lines and sailed out

* See "Martinique, Caribbean Question Mark," by Edward T. Folliard in the NATIONAL GEOGRAPHIC MAGAZINE, January, 1941.

around Fort St. Louis, just as the fleet under de Grasse had done 165 years before. Fortunately for us no Rodney was watching from Pigeon Island, waiting to pounce.

The gentlest of breezes fanned us out of the magnificent bay and along the western coast, where we paralleled the coastal road. The slopes of Pelée dominated the landscape, and for a miracle its peak was almost clear of clouds (Plate XVIII).

From the water the town of St. Pierre looks like most other West Indian towns of similar size. None of the damage caused by the eruption of Pelée is immediately visible. But ashore it is different: the passing of 45 years has softened, not obliterated, the scars. Here stands a windowless house, a mere shell of stone and mortar; there, a weed-covered plot with a heap of rubble in the center.

Pelée Leveled St. Pierre Like Atomic Blast

I was struck immediately by the curious parallel between the tragedy of St. Pierre and the holocausts of Hiroshima and Nagasaki.

A contemporary report on the eruption by Robert T. Hill in the National Geographic Magazine, June, 1902, reads like the eyewitness accounts of the destruction of the Japanese cities by the atomic bomb.*

When Mount Pelée erupted on May 8, 1902, an awful blast of flaming gases and superheated steam suddenly burst from the volcano's side and engulfed the town. Its force leveled whole streets of houses. Bodies found among the ruins were naked. Clothing was burned and blown away. Fires broke out at numerous points. Except for one criminal in a tiny hillside jail, who was burned so badly that he died a few days later, the entire population of some 40,000 perished within seconds.

Not one thing remained alive: animals, birds, trees, and flowers were reduced to gray ash.

Of 18 ships anchored in the harbor, only the British freighter *Roddam* remained afloat, and she was heavily damaged.

In the Museum are relics testifying to the frightful heat: blobs of nails fused into one mass; perfume bottles altered in shape but with liquid sealed inside; cinders that were once books or packages of food (page 8).

Before leaving Fort de France we had listened to the same old story. "Watch out for that Dominica Channel," warned Roy-Camille of the sloop *Enchantress*. "I've cruised these waters all my life, and the others are nothing. But that Dominica Channel, phew!"

Although it was slightly rougher than the others, we had a glorious sail, occasionally putting the rail down but always coming closer to the mountains we could see through the spume to leeward (Plate XXIV).

We had our heaviest wind after we had rounded Scots Head and were in the shelter of the land. For a while we lay almost becalmed, even our flags drooping. Suddenly we heard a faint moan towards shore. We saw a line of tiny, creaming wavelets advancing at high speed.

The wind hit like the pressure of a heavy hand and forced *Carib* down on her side until the liferail stanchions were partially buried.

It was a "white squall"—one of those dread gusts which, rushing down the valleys, were the terror of the old square-riggers. Sometimes these heavily sparred ships would not recover from the knockdowns, especially if the cargo shifted. But a modern yacht of proper design is in no real danger.

On arriving at Roseau we left poor Al to watch the boat while we took to the hills. This roadstead was one of our roughest anchorages; the ship rolled continuously. With a feeling of guilt, we joined our friend, John Archbold, at his plantation in the mountains. He met us in a Ford touring car whose doors automatically flew open at every bump, and in it we began to climb the Imperial Road.

Dominica—Skipper's Favorite Isle

I have tried to avoid superlatives in describing the islands, especially as there are amazing differences between them and each seems to excel in some way. Still, I feel justified in describing Dominica as the most lush, most rugged, and most primitive of them all.

No power of pen or lens can convey the luxuriance of the foliage or the wonderful shades of green. The vegetation lacks the oppressiveness of a tropical jungle, and the mountains, crisscrossed with ridges and valleys running in every direction, seem like a confused, tide-ripped sea solidified.

It was a delightful change. In the mornings we sat on the terrace writing and looking far down the valley to the sea. At noon there would be a swim in a bubbling mountain stream shaded by arches of bamboo. In the evenings there were comfortable chairs and easy conversation.

Dominica's people seem always busy—managing citrus plantations, writing, growing things not native to this hemisphere, extracting drugs from medicinal plants, building furniture from local woods, and experimenting

*See "The National Geographic Expedition to Martinique and St. Vincent," National Geographic Magazine, June, 1902, and "Report by Robert T. Hill on the Volcanic Disturbances in the West Indies," July, 1902, accounts of The Society's first expedition, undertaken within five days of the report of the St. Pierre disaster.

Stone Lizard, Rearing an Inquisitive Head Seaward, Gives Guana Island Its Name

Guana (short for Iguana) is one of the 100-odd Virgin Islands. Columbus, discovering the group in 1493, named them in honor of St. Ursula's legendary 11,000 female companions massacred by the Huns. On this island an American family makes its home (page 39). Water comes from a cistern built in 1740.

with new methods of cultivation. And all this on an island which has no sawmill, practically no roads, and no regular steamship or airplane service.

Eventually John had to return to the States, and we went "home" to the *Carib*. After an overnight stop at Portsmouth, on the northern end of the island, we headed for Iles des Saintes, a group of tiny islands which nestle close to Guadeloupe.

Again we were paralleling the course taken by de Grasse in 1782. It was a lazy day.

As Zib sat in the cockpit shelling pigeon peas, I told her the story from the wheel: "The British had a score to settle with Admiral de Grasse. He had blocked their attempts to reinforce Cornwallis before the Battle of Yorktown, and that defeat had lost the American War of Independence.

"Besides, the French were challenging the British as a naval power—they were so cocky that it's said a wealthy Frenchman paid off Rodney's debts so he could command and the French wouldn't miss the glory of beating Britain's best admiral!

"Theoretically, the French had a slightly stronger fleet. As de Grasse left Fort de France, the British followed from St. Lucia. Rodney caught up about here. For two days he maneuvered, looking for an opening. It came on April 12. It was a real slugging match, but little by little the French guns were silenced. This water was red with blood and dotted with smoking hulks and wreckage.

"Finally de Grasse struck his colors, and the British won the Battle of the Saintes, domination of the West Indies, and mastery of the seas! Rodney was a tough old boy!"

The Iles des Saintes are quaint and charming, and the anchorage off the principal town, Bourg des Saintes, is well sheltered (Plate XX). On going in we found the water so clear that the sand seemed just under the keel. Al made a cast with the lead to report: "No bottom at seven fathoms!"

On leaving, we crossed to Basse Terre, Guadeloupe, in less than three hours despite a light breeze. To our surprise we were met by the harbor master, who pointed out the best berth and assured us that no further formalities were necessary: Bill Christensen, at that time U. S. Consul in Fort de France, had sent a telegram to the Governor.

Next day we hired a car for the drive to Pointe-à-Pitre, the principal commercial city, and I had one of my daily lessons in geography. The island of Guadeloupe consists actually of two islands: Basse Terre, to the

west, of volcanic origin and extremely mountainous; and Grande Terre, to the east, of limestone formation and very flat in comparison.

Soufrière, dominating Basse Terre, is an active volcano which towers to 4,867 feet, while the highlands of Ste. Anne, on Grande Terre, rise only 375 feet above the sea. The two are divided by the Salée River. It is amazing to see such completely different landscapes on either side of a narrow ribbon of water.

Food Plentiful in Guadeloupe

Basse Terre had one of the best native markets we found on the trip. Each town on every island has an area reserved for produce brought in by the neighboring farmers.

By daylight women are squatting behind piles of tomatoes, plantains, yams, pigeon peas, limes, coconuts, breadfruit, papayas, oranges—everything that grows in the incredibly rich soil. Other women sell cakes and little sugar patties, medicinal herbs, eggs, bits of cloth, papers of pins, tin cups, pottery.

Underfoot dart children and dogs, while chickens tethered by one leg range as far as their cords allow. There is a confusion of noise and color and odor, but everyone is good natured and enjoys the bargaining. In such markets, Zib, as cook, and I, as basket carrier and assistant haggler, did nearly all our shopping.

Food was not a problem. Most staples, canned and otherwise, were shipped down aboard *Carib* from New York. But they would have been available locally, although at a much higher price. We were able to buy vegetables, fruit, bread, and eggs at nearly every stop. Meat was scarce, as was—surprisingly enough—fish.

Water was our only real headache; except for that taken on at U. S. "destroyer deal" bases, we could trust it nowhere. All taken aboard was laboriously boiled and bottled before drinking. Ice, that manna of the Tropics, was available in large towns.

After a rainy night in the harbor of Deshaies, where we stopped to break the run, we set a compass course of NxE. For the first time since leaving Grenada our next objective was not in sight.

For the first time, too, we were besieged by squalls. All during the morning black clouds made a ring around us.

As one series would disappear to leeward to hide the mountains of Montserrat another would come drifting in from the open Atlantic. At one moment we would be wallowing in a nasty sea with no wind to fill our canvas; at the next, standing by the main halyard to douse sail if there was too much. Such conditions are trying for a small crew.

Shortly before noon the coastline of Antigua showed clearly, and the wind steadied and freshened from the southeast. We closed fast, trying to identify the entrance to English Harbour—a place so well sheltered that it had once been the hurricane refuge of the British fleet.

Closer and closer we came to a wall of sheer rock. A sea had made up and was breaking heavily all along the coast. I read and reread the *Sailing Directions for The West Indies*, studied the chart, and peered through binoculars. I could see no entrance.

Suddenly we were in too close, and there was a scramble to get in the mainsail. A squall hit, we shipped a heavy dollop from the backwash off the rocks, and I hurt my hand on a reef cringle as the sail slatted—getting three misfortunes over in a hurry.

With forestaysail and mizzen sheeted in flat we were virtually hove-to, but still I couldn't see the entrance. While the look of the coast seemed to match the description, we couldn't be sure. And you don't run a boat towards a lee shore unless you are really sure!

So we bore off and ran downwind about a mile to look into neighboring Falmouth Harbour, made our check identifications, and beat back to our old stand. Even then the entrance was hidden.

But this time we confidently sailed towards the rocks and suddenly looked into the entrance, followed it around an S-turn, and found ourselves in the best anchorage I have ever seen (page 37).

To port lay the remains of the old dockyard, formerly commanded by the immortal Nelson himself, to starboard a house once occupied by the Duke of Clarence, afterwards King William IV.

Carib Moored in a Giant Cup

We were in a giant cup, the surrounding hills topped by weathered fortifications.

For a couple of days and nights we swung around our anchor in perfect peace despite the fact that technically we were lawbreakers, having come into a place not legally a port of entry. But the authorities were lenient and gave us clearance, and Chief Magistrate Charlesworth Ross appeared with then U. S. Vice Consul Nicholas Fuller, not to censure but to welcome and invite us to a picnic.

The buildings of English Harbour are in surprisingly good repair, and it is unfortunate that funds do not exist for their preservation.

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Kodachrome by Carleton Mitchell

Like Columbus' Caravels, *Carib* Runs down the Trade Winds, Exploring the West Indies

On her 3,000-mile voyage from Trinidad to Maryland, the ketch cruised the Spanish Main, followed the wake of early navigators, and visited storied islands where long-forgotten battles were fought and pirates roved. Aeolus, god of winds, smiled, for *Carib* sailed warm, sunlit seas with mostly fair breezes.

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Kodachrome by Carleton Mitchell

Her Rail Buried, *Carib* Drives Through the Chop off Boca de Monos, One of the Dragon's Mouths—Trinidad

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III

Kodachrome by Carleton Mitchell

Carib Wears a Wooden Cradle but No Masts. At Port of Spain She Swings into Deep Water

Kodachrome by Carleton Mitchell

Laura, the Man-hating Parrot, Poses with a Distrustful Eye on the Cameraman

A hotel's pet at Basseterre, St. Kitts, Laura seldom misses an opportunity to sneak up on a trousered leg and bestow a stealthy nip. For women, such as the hotel maid, Laura willingly "sings."

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Ektachrome by Carleton Mitchell

A St. Lucia Fisherman Weaves an Intricate Maze Trap for Unsuspecting Fish

Bamboo poles (right) are sliced into thin strips (below). The completed labyrinth is easy to enter, but hard to escape. Baited with scraps and weighted with stones, the trap is thrown into the sea.

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Kodachrome by Carleton Mitchell

On the Lush Island of Grenada There Is a "Desert" on Which Giant Cacti Thrive

Mountains on the island's windward side a few miles away may catch 156 inches of rain, but flat Saline Point gets only 30. Sheep (right) graze on a hardy imported grass. Two models indicate the stature of this *Cereus griseus*.

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Ektachrome by Carleton Mitchell

Red-roofed St. George's Hugs Its Carenage (Careening Harbor). *Carib* Swings at Anchor in a Dead Volcano's Flooded Crater

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Chocolate Scents the Air along St. George's Quay Where Cocoa Beans Dry in the Tropic Sun—Grenada

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Kodachrome by Carleton Mitchell

Grenadans Rush to Market to Buy a Slice of Dolphin Just Brought In by the Sailing Canoe

Though water lies everywhere, the island is shy of sea food. When a successful fisherman sails in, he finds no lack of customers.

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Grenada Carnival Girls Wear Bottle-top Hats Advertising Lotion

Kodachromes by Carleton Mitchell

Miss Muffet in a Plastic Dress Eats Curds from a Plastic Bowl

King and Queen for a Day Lead Their Subjects in Grenada's Carnival Parade

She is the popularly elected monarch, he her chosen consort. Next time a king will be elected; he will select a queen.

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Kodachromes by Carleton Mitchell

Bandsmen Beating Steel Drums Assault Grenada's Ears with Deafening Shock Waves

To achieve a musical effect, the "Hellcats" temper their drums with heat treatment. Another "steel band," using parts of old automobiles as instruments, achieves weird effects.

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Kodachrome by Carleton Mitchell

Singers Serenade St. George's Hotel Guests, Who Toss Coins from the Balcony

Grenada's troubadours, some in masks, wear scarves flowing from floppy straw hats. Guitars provide the music. Hotel servants, peeping from windows, enjoy a free show.

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Kodachrome by Carleton Mitchell

Like Coach Dogs, Porpoises Leap Ahead of *Carib's* Bowsprit. Never Tiring of Play, They Frequently Circle the Ship

© National Geographic Society

Kodachromes by Carleton Mitchell

On Carriacou Island, the Grenadines, Oysters Grow on Trees. They're Small but Delicious

Oysters cling to the tentaclelike roots of mangroves that fringe a snug lagoon off Tyrrel Bay. Men harvest the bivalves by lifting a root, cutting off the largest clumps.

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Ektachrome by Carleton Mitchell

Careened in Kingstown Harbor, a Trading Schooner Lies on Her Side. A Raft Crew under Her Counter Replaces Wormy Planks

Sail still carries interisland commerce, and old-time techniques survive. This vessel is "hove down" by tackles to the workship.

Petit Piton (Little Peak), Mariners' Landmark for Generations, Beckons *Carib* to St. Lucia

Here two neighboring mountains, one out of sight to the right, are the mummified spines of lava that cooled in two volcanic vents.

Petit Piton's steep 2,461 feet went unclimbed until 1878, when a Frenchman gained the summit. Its taller but less precipitous neighbor, Gros Piton (2,619 feet), is an easier climb.

Tradition says that long ago three English sailors set out to scale Gros Piton. As watchers followed them with glasses, they were seen to fall, one by one, presumably victims of the deadly fer-de-lance, a snake that once infested St. Lucia.

In this lee calm, the mountains snuffed out the breeze and *Carib,* her sails furled, resorted to her engine. Spare fuel rides in tins beside the rail. The green starboard running light (on rigging) is for night use.

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Ektachrome by Carleton Mitchell

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Ektachrome by Carleton Mitchell

St. Kitts's Crop Is Sugar; Tall Cane Grows Right Up to Mountain's Craggy Brow

Planters cultivate every available inch. Were the slope beyond less steep, it too would be farmed. Here a four-horse team carts the stalks away to the mill's narrow-gauge railway.

I know of no other place in the world having a closer connection with the vanished age of sail.

Here are the old careening capstans, the sail lofts, the small-boat landings, the warping rings—nearly everything required to maintain a frigate far from home. It is worth a pilgrimage by any lover of the sea and ships.

On our way around to St. John's, the principal port, we found ourselves skirting outlying reefs for the first time on the passage. The harbor itself is large but shallow. There are fertile plains covered with sugar cane, and many magnificent swimming beaches. During the winter months the climate is nearly ideal.

Nevis—Birthplace of Alexander Hamilton

From Antigua, Nevis—and "the course, west!" Although less than a fifth of our distance lay behind we had the feeling, as we rounded the bend, of being on the homeward leg (chart, page 7).

Due to a late start it was dark before we arrived off Charlestown, to creep close to a dim red light on the jetty. We anchored in the center of a fleet which turned out to be sailing barges used for ferrying sugar cane to St. Kitts. Although much cane is grown locally, there is no sugar mill.

Nevis consists of a single volcanic cone thrusting out of the sea, its gradual slopes patterned by fields, its peak nearly always lost in the cloud cover that inspired Columbus to name the island for snow. First settled by English colonists in 1628, it was ravaged repeatedly by the Spaniards and French.

Here Alexander Hamilton was born, Captain Nelson of His Majesty's Ship *Boreas* married the widow Nisbet, and the wealth and fashion of the West Indies met at the old Bath House Hotel to "take the waters."

Travelers were writing of the curative value of these thermal springs as early as 1625, and we were able to give them a try, although they are not now open to the public.

St. Kitts is so close to Nevis as to seem part of it, but actually the two are divided by a turbulent gap called the Narrows, which native craft are unable to cross in heavy blows (Plate XXII).

We found the harbor at Basseterre so rough that we moved ashore to Shorty's Hotel, one of the pleasant spots of the Caribbean. Here Laura, the parrot who hates men, rebuffed my every advance but finally consented to pose for a picture (Plate IV).

Practically the entire effort of the community is geared to sugar. There is a huge factory, and every available foot of ground is under cultivation (Plate XVI).

Crowning a steep mass of rock is the fortress of Brimstone Hill, designed to be Britain's impregnable "Gibraltar of the West Indies." Guns were placed atop this limestone height as early as 1690; its last garrison was not withdrawn until the Crimean War.

During its long service it was besieged and captured only once: by the Marquis de Bouillé in 1782, who so admired the bravery of the defense that he returned the rival commanders to the British! Afterwards it was more heavily fortified but was never attacked. From its battlements there is a magnificent view (Plate XXIII).

Next we came to St. Eustatius, or Statia, our first Netherlands West Indies colony.

"What is that yellow flag?" asked the policeman in the stern of the rowboat alongside as our anchor splashed down.

"That flag?" I repeated in surprise. "That's the Quarantine flag—it means that we are coming from a foreign country and want to enter."

"Oh!" he said, swinging aboard. "You don't need anything like that. You're welcome here."

Later Ernest Voges, the governor, elaborated: "We're too small for red tape and all that nonsense."

First Salute to U. S. Flag Brings Calamity to St. Eustatius

At the top of the hill overlooking the roadstead harbor stands Fort Orange, whose cannon first formally acknowledged the sovereignty of the United States (Plate XXVII).

At that time Statia was called "The Golden Rock." As it was a Free Port, nearly all trade between Europe and the Americas funneled through the warehouses which lined its beaches. As many as 700 ships sometimes lay at anchor.

Into Statia on November 16, 1776, sailed the U. S. Brig-of-War *Andrew Doria,* flying the flag of the new Republic. Its guns roared out the national salute.

There was a long pause. Bluff old Johannes de Graaff, the governor, had a difficult decision to make, as Holland was at that time neutral. Then came the reply—the first salute to a flag of the United States.* While this honor encouraged the embattled American

* The flag saluted was the Great Union Flag raised on January 1, 1776, at Somerville, Massachusetts, in honor of the birth of the new Army. This early symbol of unity had 13 red and white stripes, but the Union Flag of Great Britain was in the canton in place of the stars. The first salute to the Stars and Stripes (as adopted June 14, 1777) was fired by the French in Quiberon Bay on February 14, 1778 (see "Our Flag Number," NATIONAL GEOGRAPHIC MAGAZINE, October, 1917).

"Donkey on Wheels," Twisting Down a New Road, Revolutionizes Life on Rugged Saba

Before this corkscrew highway was completed in 1947, the crater-pit town of Bottom carried imports 1,000 feet from Fort Bay Landing on porters' heads or donkeys' backs. Now comes a mechanical donkey, the jeep. Seeing it, several islanders ran to the hills. School children, taking their first ride, screamed when "houses went back so fast."

colonists, it incurred the wrath of the British —especially tough old warrior Rodney.

Nearly five years elapsed before he could take his revenge. Upon declaration of war against Holland in 1781, Rodney swooped upon Statia even before its inhabitants knew that peace had been ruptured. He did a thorough job. Its warehouses and homes were stripped and auctioned for over £3,000,000. What could not be sold was burned, and the warehouses were pulled down. Their ruins still lie scattered on the beach.

We arrived during a drought. The island was sere and brown, but amazingly neat. Even the town streets seemed freshly scrubbed. Governor Voges was most hospitable, insisting that we spend a night in his house, and giving us a party.

Among the guests were representatives of the Pandt family. An ancestor, Hendrick Pandt, was one of the signers of the capitulation to Rodney, which, incidentally, began: "Well knowing the honor and humanity of the two commanders . . ."

From Statia we looked across at Saba, a symmetrical shape that has reminded some of Napoleon's "cocked hat." The island had an air of mystery: its summit hidden by a cloak of white, while blue shadows made shifting patterns on its sides.

As we came closer, Saba looked even more forbidding. The sea creamed against gray rocks at its base. Fort Bay, the principal landing, offered poor shelter, for a big sea was running in the "anchorage."

"Governor" Huith, informed of our coming

Strong Arms and Calloused Feet Launch a Surfboat Across Saba's Stony Beach

Visitors are ferried from ship to shore and back. Like most passengers, the author's wife is carried out in a boat. Once the sea grips the stern, oarsmen jump to stations (Plate XXVIII).

by radiotelephone, met us in a surfboat. Before going ashore we put *Carib* on the leeward side of the island in the relative shelter of Ladder Bay—sheltered, that is, if the wind does not shift.*

Jeep Replaces Donkeys on Saba

On the island we found to our amazement that the machine age had arrived: a jeep now roars up a new road between Fort Bay Landing and the lofty town of Bottom! The road had been five years a-building; the jeep had been on the island only a few weeks (page 34).

When the jeep was first driven, several inhabitants took to the hills—the higher ones—and it was dubbed "the donkey on wheels." Now another road is being constructed to the more distant town of Windward Side, and it is rumored that KLM (Royal Dutch Airlines) will institute helicopter service by 1950!

We had five delightful days ashore, staying at the Government Guest Houses at Bottom and Windward Side (Plate XXVI).

Saba is a place of amazing contradictions. The inhabitants are Dutch, yet speak English. Bills are quoted in Dutch dollars, which do not exist, and are collected in guilders. The town at the top of a mountain is called Bottom. Although producing little, Sabans during the war sent relatives in the United States packages containing soap, butter, and sugar.

The men are great sailors. Nearly thirty now captain U. S. steamers; the commanding officer of one of the first supply ships to make the original African landing was a Saban.

On leaving, we chose to ignore the jeep and to walk down the Ladder, the bane of earlier

* See "Saba, Crater Treasure of the Indies," by Charles W. Herbert, National Geographic Magazine, November, 1940.

Here Lived the Immortal Lord Nelson

At English Harbour, Antigua, Nelson commanded H. M. S. *Boreas* from 1784 to 1787. His old home is restored. Its original furniture was sold when English Harbour's dockyard was abandoned (pages 16 and 37).

Produce of Sea and Sun . . . Salt from the West Indies

On Great Inagua, Bahamas, a foreman inspects a shovelful pried from the bottom of a salt pan. Sluice gates admit ocean brine; tropic sun and constant trade winds evaporate the water quickly, leaving salt (Plate XXX).

***Carib* and a Native Sloop Disturb the Slumbers of a Ghost Town, English Harbour, Once a Mighty Naval Base**

In this Antigua anchorage the British fleet sought shelter from hurricanes. Half a century ago the Admiralty abandoned it. On the breakwater stand old careening capstans used for heaving down wooden ships. Only stone columns remain of the boathouse (right). Seamen's quarters are deserted.

Where Gossip Is as Lively as Barter: the Market in Roseau, Dominica

Into town stream parades of country people with headborne cargoes of produce. Jamming the market's interior, they overflow to the curb. Their leisurely customers treat the street as a public forum. Zib, *Carib's* mate, made purchases almost daily at these open-air vegetable stands.

travelers. We had listened to arguments as to whether it consisted of 509, 513, or 533 steps but lost count before getting down (Plate XXVIII).

Saba is a notoriously bad place for yachts. During our visit I hired an islander to stay aboard with Al. Fortunately the wind continued to give them good shelter in Ladder Bay. But *Carib* did not get away unscathed.

On leaving, I gave Al a hand with the windlass, as all our chain was veered. There was a heavy pull, and then it came in easily. I called "It's broken out!" and cranked faster. But the anchor had caught under a rock and came up a useless bar, lacking flukes.

For a couple of days the weather had looked threatening. Solar and lunar halos, combined with weird cirrus cloud formations, made me think heavy winds were in prospect (page 39). Between us and St. Thomas lay the hundred-mile waste of the Anegada Passage, not renowned for its gentleness.

We left Saba late in the afternoon and carried a beautiful quartering breeze throughout the night.

But the dawn sky made us glad that St. Thomas was just over the bowsprit. As we picked up a mooring, in the most sheltered part of Charlotte Amalie harbor, a hard squall swooped down. For the next five days we lay snug while the strongest winds of the winter lashed the island.

From St. Thomas we backtracked through the Virgins to see our old friends, Louis and

Cirrus Cloud Formations, So Beautiful to Behold, Fill the Sailor with Misgivings

Seen on Saba Island, these gaudy sky effects disturbed the skipper as he contemplated running the 100-mile Anegada Passage. The weather remained fair, however, until *Carib* berthed down in Charlotte Amalie, Virgin Islands; then she was windbound five days.

Beth Bigelow, at Guana Island. It was just as beautiful as we remembered it from our visit before the war.

"Did you ever see a lobster caught with a forked stick?" asked Louis.

"Can't be done," I replied—to be proved wrong with little delay.

Taking two Tortola boys, we went to a cove on the windward side. One of the boys carried a tree branch cut to form a deep fork; the other, a rod. They selected a promising coral ledge, and the one with the forked stick took a position about 20 feet away.

After a moment of prodding with a rod a crawfish streaked for open water.

The forked stick came down, and there we were with dinner! The crawfish could be seen through the clear water (Plate XXIX, right). What still puzzles me is how the boy knew where to stand!

After rounding the curious rock formation that looks exactly like the head of a giant lizard, and from which Guana takes its name, we glided back through beautiful channels to the familiar mooring at Charlotte Amalie. Here *Carib* was hauled and painted while a recalcitrant generator was repaired.

Since the Navy was holding firing practice off Culebra Island, we could not lay a direct course for Puerto Rico but had to keep clear of a restricted area that extended south almost to Vieques Island. Still, before dark we were in the harbor of Fajardo, a commercial port at the eastern end of Puerto Rico.

The next morning we bounced through the gap behind the Cordilleras Reefs, and on the afternoon of April 27 came to anchor off the Club Nautico in San Juan Harbor.

Thus ended one phase of our cruise. We had planned to loaf from Port of Spain to San Juan, staying at each island as long as we wanted, anchoring every night.

We had taken three and a half months to sail 900 miles. So far the three of us—helped by guests on a couple of short runs—had sailed up without hardship or difficulty. But from here on we had to do some passage making.

Long runs can be very tiring when only two men must split "watch-and-watch." To our delight we were joined by an old shipmate, Henry K. Rigg, of Annapolis, a top sailorman.

Steady Trades Fill Our Spinnaker

We gave Bunny a fine introduction to Trade Wind sailing; after we left San Juan Harbor the wind was dead astern, so we hoisted the small spinnaker—a parachutelike sail set on the opposite side from the main. The mizzen, or after sail (Plate XXXII, upper) was doing little except blanketing the main, so we furled it, rigged a cockpit awning, and slid along admiring the view and pitying all landsmen.

But conditions did not long remain ideal—they never do, not even in this part of the world. With night the breeze dropped off to leave us wallowing horribly in the Mona Passage, where we had anticipated good wind.

With morning the Trades came back, and for the next two days and nights the storied coastline of Hispaniola lay to port as *Carib* rolled along in the track of the early Spanish navigators.

We were at Cap Haïtien before dawn of the fourth day to replenish our supply of ice and fresh stores, and to make a visit to Christophe's palace.

The next stop was the island of Great Inagua, one of the Bahama group, where an American family, the Ericksons, have revived the ancient salt industry. Sea water is run into flat areas called "pans" to be evaporated by the fierce heat of the sun (page 36). Salt forms in huge crystals on the bottom and is harvested by hand or machine.

At one stage the water becomes a deep rose in color. This is caused by red algae that grow in the brine—an expert can estimate the density by the color (Plate XXX).

On my stop the year before only Bill Erickson was on the island, as his brothers were still in military service; this time, however, the family was reunited, and we were fortunate enough to arrive for a party.

No one could see this group and what it has accomplished without realizing that the old American pioneering spirit has not died.

Beyond Great Inagua lay familiar waters. We were backtracking our runs of the previous winter—the Mira Por Vos Pass, Crooked Island Passage, and Exuma Sound.

The wind stayed in the east as we slid along with sheets freed and a fishing line trailing astern.

Nassau is like a second home to us, and it was with excitement that we dropped anchor off Prince George Wharf.*

For the last lap we were joined by another friend, Dan Rugg, of Pittsburgh, just recovering from an illness. While some might question the benefits of a pitching small boat for the relief of a stomach disorder, Dan improved rapidly—proving that nothing really bothers a true sailor except life ashore.

The favoring current of the Gulf Stream helped us on our ocean run up the Atlantic coast, and 3 days, 4 hours and 30 minutes after we crossed the bar off Hog Island, buoy "6C" at the entrance to Charleston, South Carolina, was alongside.

As *Carib* passed through the jetties, the water changed color from blue to muddy brown, and another phase of the trip was finished. We had covered the 1,500 miles from San Juan in three weeks, even with a week's layover in the Bahamas.

For the next five days we "ditch-crawled" the Intracoastal Waterway, powering up through the Carolinas and Virginia, enjoying the scenery and the mirror-smooth water, almost overwhelmed by the perfume of the honeysuckle that grows along the banks of the canals.

"Beware of the Chesapeake!"

The weather forecast at Norfolk promised fresh winds, but it took the motor to push us up the home stretch, Chesapeake Bay. Then, off Thomas Point Light, with almost 3,000 miles astern and only 3 ahead, we had our tragedy.

I was lazing at the wheel admiring a white steamer and the graceful curve of the bow wave as it spread across the glassy water.

Suddenly *Carib* stuck her snoot into that wave, her mind doubtless occupied by thoughts of her comfortable stall at the Annapolis Yacht Club, now so near. She gave a startled leap, and there was a crash from the cabin—the coffeepot had upset over everything!

"Beware of the Chesapeake on a calm morning," someone should have warned.

* See "Bahama Holiday," by Frederick Simpich in the National Geographic Magazine, February, 1936.

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Ansco color by Carleton Mitchell

On Gala Occasions Martinique Girls Dress in Printed Silks of a Bygone Era

When Lafcadio Hearn visited the island in 1887, such costumes were common. Now grandmother's jewelry and silks repose in mothballs; Martinique has gone modern. Tying the headdress like a turban takes skill.

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Kodachrome by Carleton Mitchell

Pelée, Killer of 40,000 People, Slumbers. Trustfully, St. Pierre Rebuilds Its Homes at the Volcano's Base

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Ektachrome by Carleton Mitchell

In Such Frail Canoes Martinique Fishermen Venture Beyond Sight from Shore. Their Nets Dry on Belle Fontaine Beach

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Carib Swings at Anchor under an Arm of the Crucifix Overlooking Bourg des Saintes in the Iles des Saintes

Fort Napoleon looks down from the hill (extreme right). Guadeloupe looms across the channel. Maneuvering in these waters, Rodney defeated de Grasse in the Battle of the Saints (1782). By this celebrated engagement Britain gained control of the seas in the West Indies and won the war with France.

© National Geographic Society

Kodachrome by Carleton Mitchell

Airman Turned Sailor Quits Wings for Sails

Al Nelson, lately of the Army Air Forces, is *Carib's* professional seaman.

Kodachrome by Al Nelson

Skipper Raises the Burgee of the Cruising Club of America

Carib lay overnight at Little St. Vincent, a rarely visited island in the Grenadines.

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Kodachrome by Carleton Mitchell

Shoppers Scamper Down to Basseterre's Beach as a Boat Comes In with Fresh Fish

Although it seems part of St. Kitts, the volcanic cone of Nevis in the distance is separated by a two-mile channel impassable to small native craft in heavy gales.

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Ektachrome by Carleton Mitchell

On Brimstone Hill an Old Muzzle-loader Points Peacefully at St. Kitts's Cane Fields. Looking Northwest: Saba (Left) and St. Eustatius

At this "Gibraltar of the West Indies," 8,000 Frenchmen besieged 950 Britons in 1782. After a bitter month-long siege the fortress capitulated with full honors.

A Seagoing Cook Comes Topside for a Trick at the Wheel

In emergencies, when all men are needed on deck, Mrs. Mitchell forgets her galley and takes the helm.

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Kodachromes by Carleton Mitchell

***Carib* Rolls, the Seas Toss; Spume and Cloud Seem to Mingle**

"Watch out for that Dominica Channel," friends warned, but the author's party had a glorious sail. Through the spray loom the mountains of Dominica (left).

© National Geographic Society

Kodachrome by Carleton Mitchell

In Oilskins on *Carib's* Bow Stands the Skipper's Wife, Looking Out for Coral Heads

Through the clear waters of the Bahama banks, coral formations, sponges, conches, and fish can be seen as if in an aquarium window. The skipper conned the *Carib* into many shoal harbors by watching the water's color.

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Ektachrome by Carleton Mitchell

Everyone in Windward Side Enjoys an Ocean View, but a Swim Costs a 1,200-foot Climb

Breezy Windward Side stands on Saba Island, Netherlands West Indies. Saba's Dutch sons roam the seven seas, but almost all come home eventually. Their native rock was one of the buccaneers' last strongholds.

© National Geographic Society

Ektachrome by Carleton Mitchell

Here the Infant United States Flag Received Its First Foreign Salute, November 16, 1776

In Fort Orange, St. Eustatius, an old Dutch cannon points to sea. During the Revolution, similar guns acknowledged the nationality of the Baltimore privateer *Andrew Doria*. The Netherlands flag still flies over the island.

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Kodachrome by Carleton Mitchell

Tireless Porters Descend the 500-odd Steps of The Ladder, Lofty Saba's Back Door. A Surfboat Rides a Sea as Clear as Air

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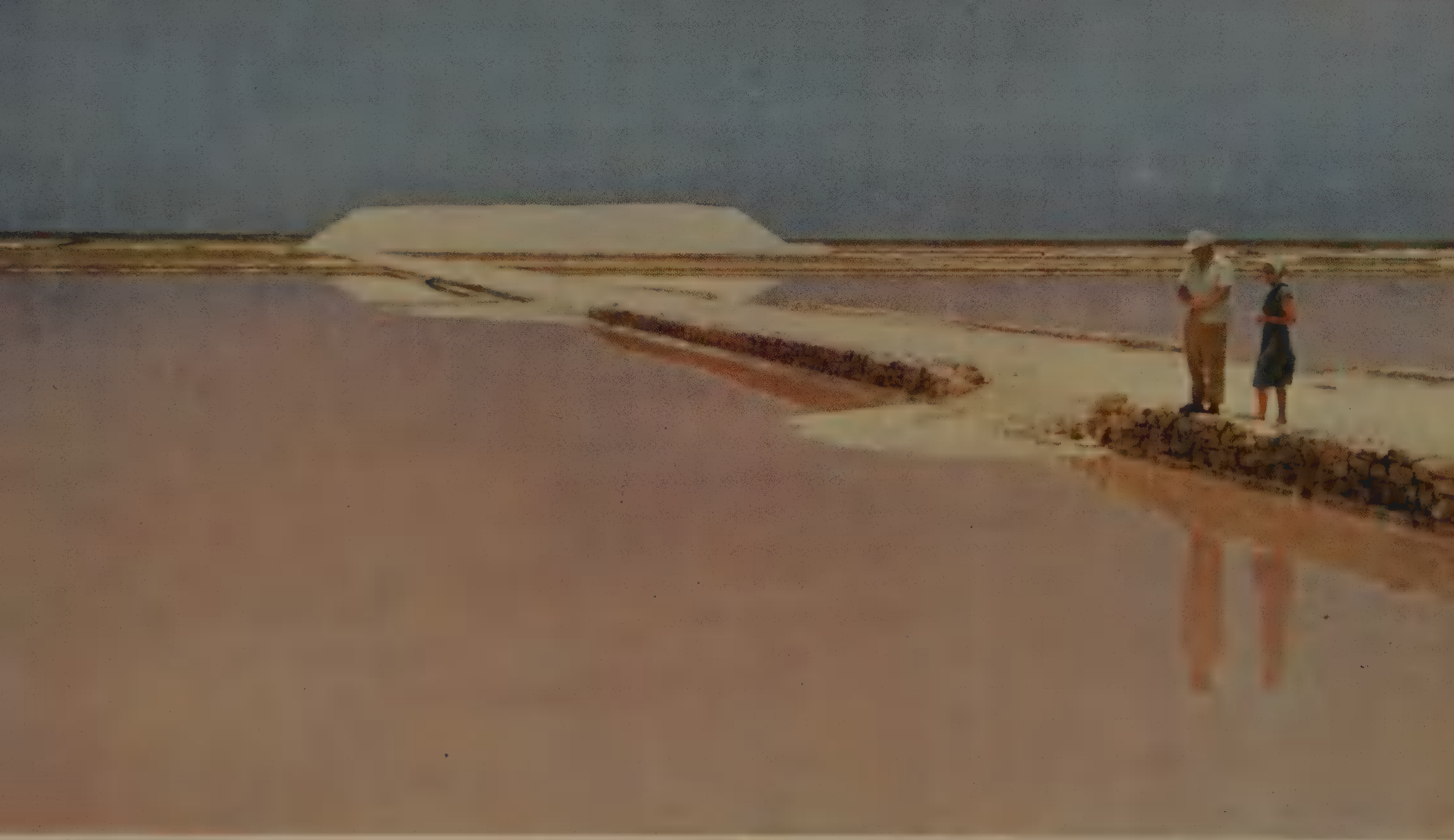
Kodachrome by Elizabeth Mitchell

"Bunny" Rigg Douses the Skipper with Tropic Cold

Kodachrome by Carleton Mitchell

Virgin Islands Lobsterman Pins 'Em with a Forked Stick



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Kodachrome by Carleton Mitchell

In Century-old Pans the Fierce Heat of the Sun Extracts Salt from Sea Water. Algae Dye the Brine a Deep Rose Red

Here on Great Inagua the Erickson family of Boston has revived an old Bahamian industry. The white mountain is not snow in the Tropics, but salt awaiting shipment.

© National Geographic Society

Ektachrome by Carleton Mitchell

So Transparent Is Nassau's Green Water that a Bather's Shadow Falls 12 Feet on the Sea's Sandy White Floor

Ektachrome by Carleton Mitchell

All Windward-working Sails Drawing, *Carib* Says Farewell to the Caribbean

Designed by John Alden and built in Maine, the ketch carries her No. 1 jibtopsail, forestaysail, mainsail, and mizzen.

© National Geographic Society

Kodachrome by Carleton Mitchell

Home! Annapolis! Ahead Lie Maryland's Domed Capitol (Left) and the Naval Academy

Seal Hunting Off Jan Mayen

By Ole Friele Backer *

SEALING in icy seas even today means bold adventure. Big ships and powerful engines help reduce the hazards, yet vessels are lost nearly every year, "screwed down" (crushed and sunk) by relentless ice.

As a youngster I feasted on all the books I could find about the sealers' life of hardship and danger. I became almost sick with wishing—wishing I could be running over the northern ice floes as one of the hardy seal hunters.

Years passed, and last spring when 31 sealing ships set out from Norway for the "Western Ice," I had a place on the motorship *Polhavet* ("Arctic Sea").

The "Western Ice" is the Norwegians' name for the rich seal-hunting region in the Norwegian Sea north of Jan Mayen Island, between Iceland and Spitsbergen (map, page 61). There, where they crawl out on the ice to whelp, harp and hooded seals are killed by the thousand for the fur of the new-born young and for blubber.

Eighteen of the 31 ships sailed from our home port of Ålesund, the other 13 from Tromsö.

Sealing Fleet Sails North in March

In the first days of March Ålesund was astir with preparations (Plate II). Winter's white mantle lay over the tidy little coastal town. Snow still fell; March very often is our month of heaviest snowfall. But the sun lifted higher every day, its rays bringing new life and energy to Nature and humans alike.

The bustle of activity reached to every corner of the harbor. The season of the herring fisheries was drawing to a close. Interest shifted to the seal hunters, preparing ships and gear for the voyage to the Arctic. Crews overhauled their vessels and swung aboard fuel and stores.

The round trip to the sealing grounds takes about six weeks, but provisions must be carried for three months in case ships are caught in the treacherous ice.

The great day came. At last we glided out of the harbor. As soon as we hit the open sea, setting course for the forbidding island of Jan Mayen, the captain ordered sails set, not so much to supplement the engine as to steady the lurching ship. Built round-hulled, like a bowl, so heavy ice would lift her from the water instead of crushing in her sides, the *Polhavet* pitched and rolled worse than any vessel I had ever been on before.

The sturdy old ship had withstood the buffetings of 30 years at sea. Modernization had given her electric light and a new engine, which pushed her along at nine knots.

Like many other sealers, the *Polhavet* was solidly built of oak with a tough skin of greenheart. Thus armored, she could withstand the cruelest clawing of the steel-hard ice.

The skipper sensed an approaching gale and had to reef canvas. Stiff with ice and snow, the sails seemed to fight the crew's struggles to subdue them.

Johan Vartdal, 44 years old, was our hard-bitten captain. He is one of Norway's leading Arctic pilots (page 63).

Our crew consisted of 16 men, 11 of whom were to do the actual seal killing. Two of the hands were sons of the skipper and others also were relatives. All were young, between 17 and 30 (page 58).

Keeping us company was another ship, the *Kvitungen* ("Whitecoat"), whose skipper is a cousin of Vartdal (Plate III).

Weather Station on Wild Jan Mayen

A howling head wind from the northwest slowed our progress. It blew the whole week it took us to reach Jan Mayen. Through breaks in the fog we caught glimpses of that rocky island, citadel of Nature at her wildest and loneliest. Some call Jan Mayen the stormiest spot in the world.

A permanent Norwegian meteorological station clings to the remote island. Bad weather prevented our landing, but we made contact with the station every day by radio.

In addition to giving us weather reports twice a day, the isolated weathermen were glad to transmit our telegrams back to relatives and friends in Norway.

Half the crew was seasick going north, but now that was forgotten. Everybody thought and talked about only one thing: seals!

The skipper spent his days up in the crow's-nest looking for the drift ice. He climbed down for infrequent meals to get warmed up. Then back he would clamber to his high perch (Plate III and page 60).

A round-the-clock watch was maintained on the radio, listening for messages between other ships ahead to get a preview of ice conditions and to learn if anyone had yet spotted seals.

A Norwegian regulation governs the opening of the sealing season. Last year killing of

* The author is a distinguished officer of the Norwegian Army.

© Ole Friele Backer

A Modern Viking Begins His Arctic Apprenticeship

Seventeen-year-old Ingvald made his first voyage to the Arctic in *Polhavet*. Crew members of the sealing fleet are young, capable, and carefree. Flaps of his woolly hat pull down over the ears on nippy days. The hunt is in March and April, when ice-pack weather is raw and cold.

seals could not start until 7 o'clock on the morning of March 23. This protective regulation was put in force as a result of careful studies of the life habits of seals. The noted zoologist, Per Höst, conducted the researches over a span of several years on behalf of the Norwegian government.

Ships Must Explore First

But the ships must be on the spot at least a week before the opening date of the season to explore ice conditions and try to locate seal herds. This often entails steaming hundreds of miles through stubborn floes.

We sailed northeast from Jan Mayen to 74° N. Nothing but open water! The skipper turned westward. Next day we met the first scattered pans—outriders of the "Western Ice."

Soon, up ahead, we saw the telltale whitish band above the horizon which forewarns of ice fields. This iceblink, as it is called, is a reflection in the sky from ice just over the horizon.

In a few hours we drove into the drift ice (Plate VI).

It was like entering a new, strange world. The sudden quiet was oppressive. Small ice floes, shaped like pancakes, surrounded us. Now and then we saw seals swimming in the leads of open water. Fresh tracks of a polar bear scrawled an unmistakable signature across a big pan.

The floes got bigger as we bumped and battered along. From the crow's-nest the skipper waved and called directions, trying to dodge large floes and scattered icebergs. Constantly he scanned the ice fields with his telescope, searching for our sleek quarry.

That night we drifted among the floes, moving only as they moved. We relished the first good hot meal in days. After drying out our fog-dampened bedclothes we all settled in for a long night's rest.

The search continued a few more days until, on the afternoon of March 23, we began to pass many herds of seals in the water. At sunset hundreds could be seen dotting the ice. The females were just about to start bearing their babies.

Captain Vartdal decided to stay put for the night in order not to frighten the animals.

The wind had been rising all afternoon and

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Frozen Spray Camouflages *Veidemann* to Blend with Black Water and White Ice

Name of the vessel means "The Hunter." Small fleets of these sturdy sealing craft sail from Ålesund and Tromsö every spring. Although the round-trip voyage to hunting grounds takes only about six weeks, the snug little ships must carry supplies for three months in case they are frozen in the ice.

© Ole Friele Backer

Ships Draw Together so Captains in Crow's-nests Can Have a Chat

Captain Kvien of the *Kvitungen* talks to *Polhavet's* skipper. Calling directions to the helmsman, the captain aloft seeks out leads in the pack ice and locates distant seal herds. From the high barrel the ocean horizon is about ten miles away, and an area of approximately 300 square miles is visible.

Drawn by H. E. Eastwood and Irvin E. Alleman

Wide Ocean Stretches Separate Drift Ice "Nursery" Areas for Harp Seals

Dotted portions of the map show approximate limits of three principal places where harp, or Greenland, seals crawl out in thousands on the shifting ice pans to give birth to their young. The "Western Ice," scene of the seal hunt described, lies north of Iceland off Jan Mayen Island in the Norwegian Sea. The line of dashes marks the approximate boundary of drift ice during the season of the whitecoat hunt.

now it blew briskly. Millions of tiny ice crystals picked up and borne away by the breeze created a spectacular red sunset. The wind also raised heavy swells underrunning the ice. This was not so good; heaving of the ice would make our work difficult and dangerous.

Close by we could hear the whimpering of the baby seals calling for their mothers. It sounded like the cry of a baby or a sea gull. At first I thought it was somebody out on the ice calling for help.

Everything was made ready for the next day. The men ground their knives and looked to their guns. We all were keyed up with a tense feeling of excitement and anticipation.

Tomorrow!

These first herds were harp seals—by far the most numerous and valuable of the Arctic seals. Three main breeding places of this species *(Phoca groenlandica)* are known: one in the drift ice off northern Newfoundland and southeastern Labrador, another between Iceland and Spitsbergen—the "Western Ice" —which also is a breeding ground for the hooded seal, and the third at the mouth of the White Sea on the Arctic coast of Europe.

Commercial sealing off Newfoundland dates from as early as 1800, with an annual catch, in its heyday, of about a half-million seals. This prodigal slaughter was a major cause for the rapid decline in sealing.

The average Newfoundland catch during the last ten years before the war was nearly 170,000 seals annually. Last year it was 96,782 seals taken by 13 ships.

In the "Western Ice" last year the total Norwegian catch in March and April by 31 ships was around 60,000, mainly baby seals. Most of our ships went back in May to the east coast of Greenland to hunt adult seals.

For years the Norwegians also hunted in the White Sea, bringing to port in 1925, for example, 340,000 seals from this fishery alone. In the last 25 years, however, the Russians

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It's Springtime in the Norwegian Sea! Ship's Hands Reef a Sail Stiff with Ice

When floes damaged *Polhavet's* hull and rudder, and pumps barely kept her afloat, youngsters of the crew ate up the last of the eggs and other delicacies given them by mothers and friends before departure. No use to let Davy Jones get them! Hasty repairs, however, saved the ship (page 64).

have increased their sealing. Last year they refused to give the Norwegians letters of safe conduct, offering as the reason danger from mines.

Headlong Race over Slippery Ice

Long before dawn on the first day of our hunt all hands were up and eager to go. The ice crew climbed overside and sprinted after the startled seals. Men jumped from slippery floe to floe, constantly risking a fall into the frigid water. Across black, treacherous leads they made long leaps (Plate VI).

When one of the men fell in, his comrades quickly helped him out. Such mishaps occurred many times a day, but in the clear, clean Arctic air no one caught cold.

Dispatching the baby seals as quickly and mercifully as possible, the men brought them to the ship for skinning (Plate IV).

It seemed a crime to kill those lovely cream-white pups. They looked so sweet and innocent, staring up at us out of big, dark eyes set in their soft spotless pelts (Plate V). It did not make the work any easier when the mother seals lifted heads above the ice to look for their youngsters (Plate VI).

Ole Friele Backer

Smiles and Storms Have Seamed the Skipper's Face

Capt. Johan Vartdal of the *Polhavet* looks through eyes narrowed from scanning vast fields of glaring ice. Although only 44 years old, he has been one of Norway's leading Arctic pilots for 23 years (page 57).

The baby harp seal must be taken while it is only a few days old. Then the pelt is soft and white, yielding a luxurious fur known as "whitecoat," which is also the name given to the young of this species. At birth the pup weighs seven to nine pounds, but when it is two weeks old it has put on a two-inch layer of fat and weighs between 40 and 50 pounds.

The fat provides a food reserve, needed because after about two weeks the mother leaves the young seal for long intervals while she returns to the sea to feed. The newborn whitecoat is not able to fend for itself until about a month after birth.

Between the ages of 14 and 20 days the infant seal loses its woolly baby suit and begins to grow a coat of stiff gray hair. Then he ventures into the sea for food.

Seal Liver Delicious

Seal meat is dark and dry. It tastes fairly good, but I would not call it a delicacy. It is used a lot on sealing vessels to supplement fresh meat brought from home. The liver is delicious, better to my taste than any calf's liver and very rich in vitamins.

The crew skinned the seals as soon as possible after hauling them aboard, while the animals still were warm (Plate VII). Thus the men saved their hands from frostbite in the chill Arctic weather.

The skinners have to be very careful. A small cut may lead to what is called "fat finger," a sort of gangrene that makes the wounded digit black and hard as wood. It used to be almost incurable, but now it yields to the magic of penicillin.

Baby seal pelts are most valuable, but we also shot some adults. Their stiff, hairy hide does not yield fur, but special treatment makes it soft and lustrous for use in gloves, handbags, and other accessories.

Mounting heavy swells now began to break up the ice floes. Many infant seals slid into the water and drowned, for during the first weeks of their life they cannot swim. Catastrophes like this may take a much greater toll of the herds than does hunting.

Fortunately, most of the mother seals had not yet given birth to their young, and they simply dived into the ocean and vanished. We never found this herd again. Its members probably swam many miles to the thick pack, which we could not penetrate.

That day we got 500 seals.

"Prepare to Abandon Ship!"

The next night big ice floes crashing against the ship woke us time and again. At 3 a. m. a very strong bump jarred me out of sound sleep. A few minutes later word came down, "Prepare to abandon ship!"

The rudder had been smashed, and the stout old *Polhavet* had sprung a leak. It was not a pleasant situation, but everyone took it calmly. Lifeboats were swung out. Using a tarpaulin, the crew managed to check the leak. With the help of the pumps we contrived to keep afloat.

A few of the men, toiling long hours, succeeded in straightening the rudder. The work was ticklish, demanding skill and bravery. Like aerial performers in a circus, the men swung on ropes under the craft's stern.

While all this was going on, some of the youngsters whose hands were not needed fried their last eggs and finished off the last of the good things which their mothers had given them when they left home.

Toward evening the ship was almost tight again. She was difficult to maneuver but could go straight ahead and even turn a little to starboard. She could hardly be swung to port at all.

If the rudder had been lost, it would have been impossible to guide the *Polhavet*. We would have been compelled to ask another sealer to pick us up and to leave the faithful, battered veteran to her lonely fate.

Hunt Turns to Hooded Seals

"Several thousand hooded seals found at 73° N., 9° W.!"

The electrifying message, received by radio, put new pep into everyone. Next day we headed for the reported position, west of our previous hunting ground. Soon we met other ships steaming the same way.

At noon we started sealing again, though the damaged rudder made the work difficult. We bumped into one big floe after another, despite the skipper's skillful directions.

The hooded seal *(Cystophora cristata)* is much bigger than the harp, some weighing up to 900 pounds. Strong and fearless, it often has scars on its hide, apparently from encounters with polar bears and fights with other seals.

Baby hooded seals are bigger than the whitecoats and may weigh 100 pounds. Their pelts, with a blue tone on the back, name the animals "blueback." The attractive fur is prized as trimming for ladies' coats (Plate I).

With today's high prices, the thick fat layer (blubber) of the blueback is just as valuable as the pelt. Fur and fat together, they are worth about 100 kroner ($20.20) each.

We took about 400 bluebacks. There must have been at least 5,000 in the vicinity. All ships in the area had flocked to this one spot. At nightfall we counted 30 masts.

One ship was missing, the *Hanseat* of Tromsö. She had been frozen into the ice.

"What did I tell you!" Captain Vartdal remarked when he heard the news. "On the very first day in the ice she got a polar bear. That always means bad luck."

The *Hanseat* did not break loose until six weeks later—with only 40 seals on board.

Next day we found a few more seals. By then the sea had calmed so we could inspect our damage in detail. It was evident we were about to lose the rudder! To save his ship, the skipper headed for home at once.

Our total catch was 1,000 seals, worth about 80,000 kroner ($16,160). Each crew member, working on shares, would collect about 1,400 kroner ($282.80). After settling expenses and paying for repairs, the ship still would make a small profit.

Two more days of thumping through the ice and then—700 miles of open sea, home stretch of a long voyage.*

* See, in the National Geographic Magazine, "Sealing Saga of Newfoundland," by Capt. Robert A. Bartlett, July, 1929.

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Kodachrome by Ole Friele Backer

Baby Seal on Hunter's Knee Will Give His "Shirt" to Adorn a Fashionable Lady

Hooded seal youngsters are called "bluebacks," because of their soft, blue-gray fur. Ole Friele Backer of Oslo voyaged with Norwegian sealers to ice fields off Jan Mayen Island to picture the annual spring hunt of harp (or Greenland) and hooded seals. Three weeks' catch by 31 ships was 60,000 seals, mostly babies.

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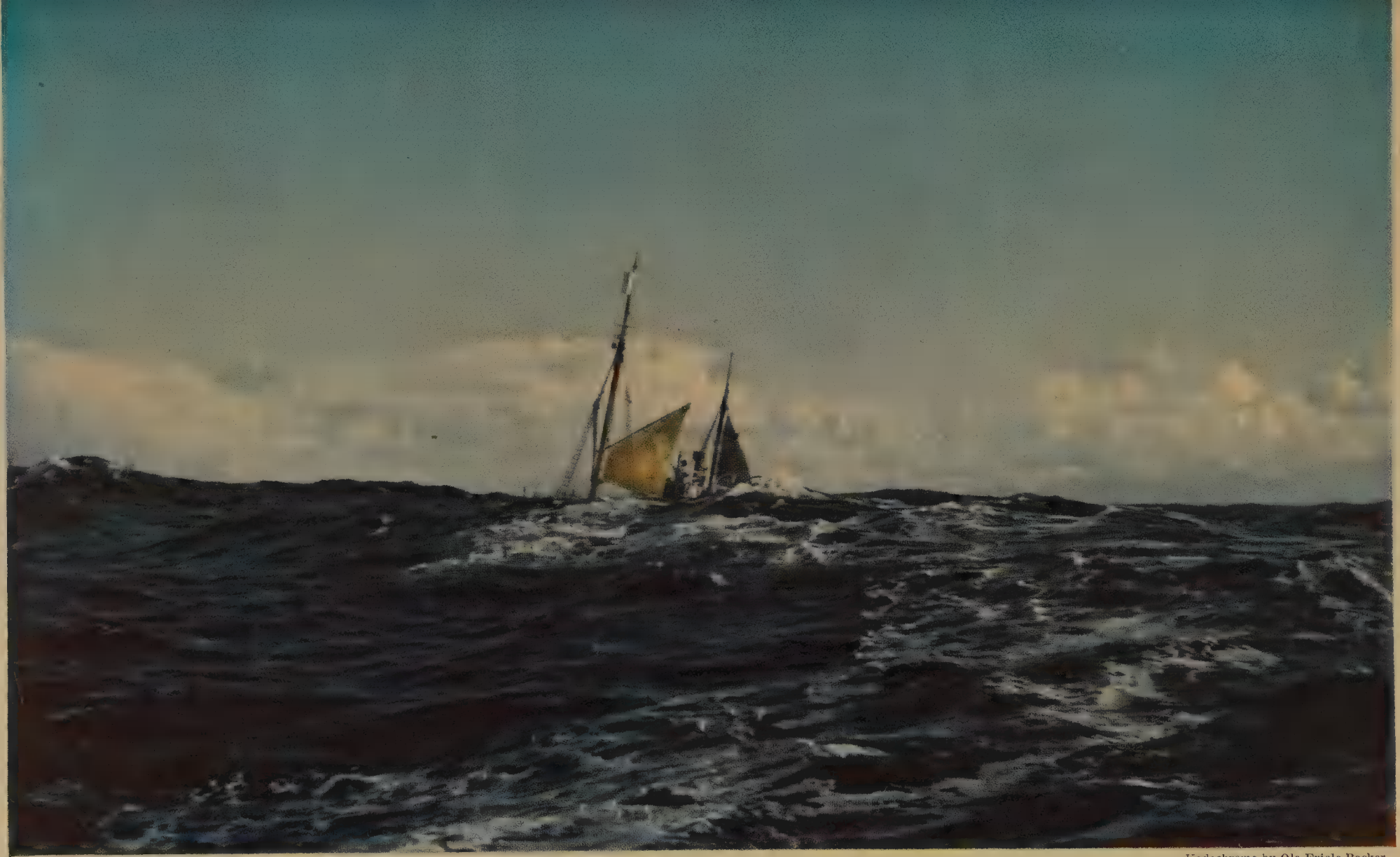
Kodachrome by Ole Friele Backer

A Forest of Masts Rings Ålesund's Peaceful Harbor, Crowded with Fishing Vessels

The busy, many-gabled Norway town is home port for a small sealing fleet and for fishing craft which catch herring, cod, ling, halibut, and other fish. During the recent war it was headquarters of an underground escape service, called the "North Sea Bus," for young Norwegians bound for England.



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Kodachrome by Ole Friele Backer

Not a Sinking Ship, but *Kvitungen* in the Trough of Mountainous Seas. She Sailed Side by Side with Author's Ship to the Arctic

From Norway it is a week's voyage to ice fields where seals by the thousand whelp on the floes. Stout little sealing vessels are built of oak sheathed with greenheart to withstand buffeting of grinding ice. To the masthead clings the white barrel of the crow's-nest, vantage point for the ship's captain while navigating through ice or searching for seals with a telescope. Sail is set to steady the round-built hull in heavy seas rather than to add speed.

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Kodachrome by Ole Friele Backer

On Arctic Ice, a Norwegian Hunter Harvests Baby Seals so Milady May Wear a Soft Fur Coat

"Whitecoats" a few days old cannot crawl as fast as their parents. Adults often escape in leads between ice pans (top). Rope with hook makes hauling rig.

© National Geographic Society

Kodachromes by Ole Friele Backer

Injured Innocence Gives Way to Yelping Wrath as Fluffy Whitecoat Eyes His Captor

Cuddly and lovable, this five-day-old harp seal is at the best age to be taken for fur. The pups lose their valuable woolly coat between 14 and 20 days after birth. During the first two weeks of its life the infant harp lives entirely on mother's milk, which has a very high fat content—48 percent, according to the author, compared with about 4 percent fat in cow's milk. Harp seals usually bear a single cub, occasionally twins.

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Kodachrome by Ole Friele Backer

On Desolate Ice Floes of the Norwegian Sea, Man's Need for Fur and Fat Brings Tragedy to Two Mothers and Their Pups

Lonely wastes are stage for primitive drama. Hunters have killed a mother seal and her cub. Sealer at left is about to capture the second youngster. Helpless to save her baby, the other mother (center) lifts her head above the ice to see what happens.

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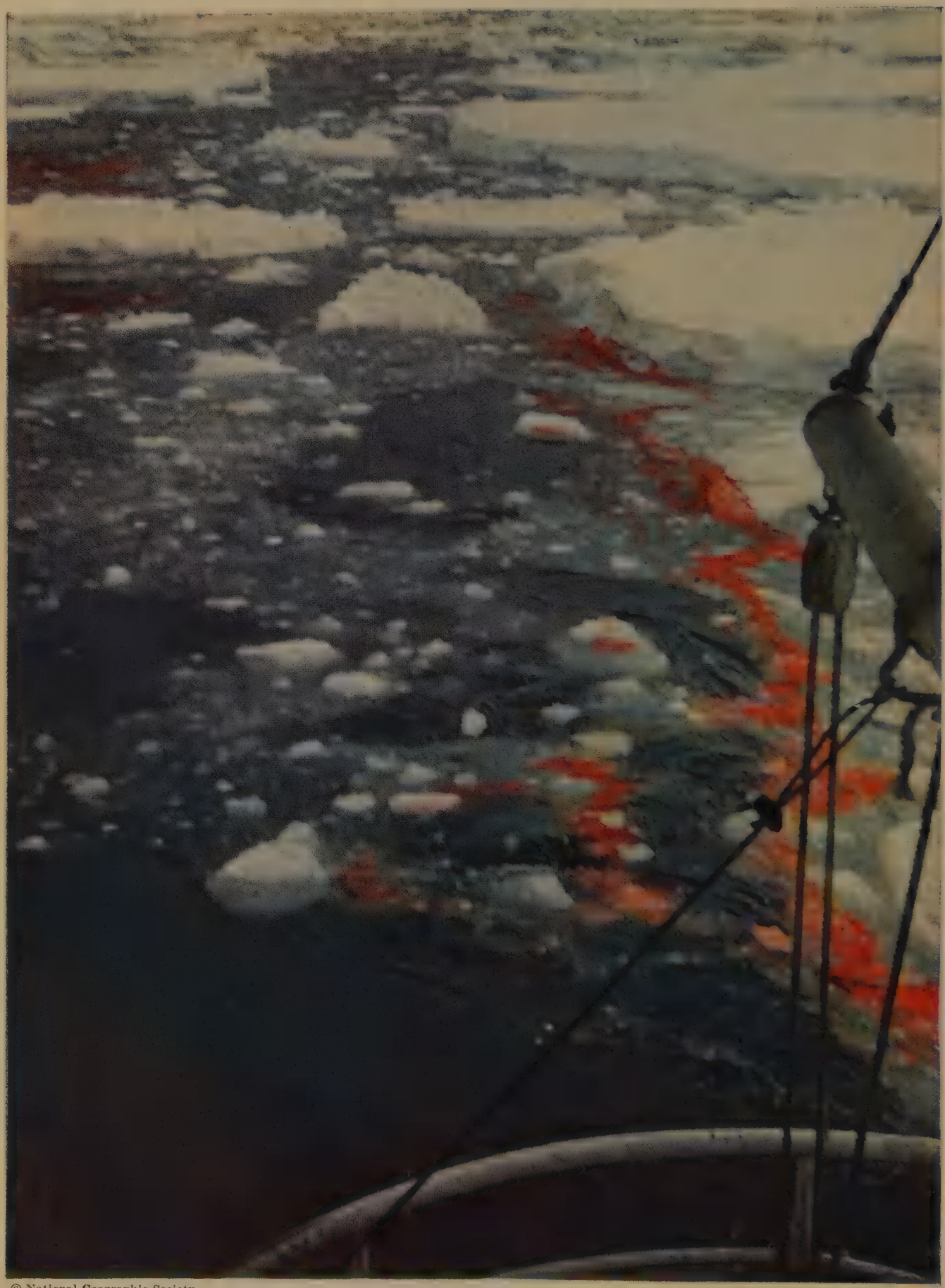
Men Need No Gloves Skinning Still-warm Seals

Crew members skin out the quarry soon after capture. Spray freezes on ship's superstructure, but men's bare hands are comfortable. Furry seals are babies.

Kodachromes by Ole Friele Backer

Deft Knife Strokes Separate Sculp from Entrails

Sculps (right, center) are sealskins and adherent blubber. Fat is removed at the home port. It yields a fine oil used in soaps, lotions, and lubricants.



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Kodachrome by Ole Friele Backer

Seal Blood Makes a "Red Sea" of Ice-choked Arctic Waters

A seal has been called "a bag of blood and fat." Adult hooded seals weigh up to 800-900 pounds; harp seals are much smaller. The *Polhavet* took 500 seals—half the catch for the whole voyage—in one day! This explains why, at the climax of the hunt, the vessel trails a ruddy wake.

We Survive on a Pacific Atoll

By John and Frank Craighead

AS WE stood aboard a Navy picket boat, ready for our adventure, we were confident that we had the most enviable assignment in the Navy. Our job was to demonstrate that man, cast away on a dot of land in mid-Pacific, can live almost indefinitely by using his ingenuity and Nature's resources.

Specifically, we were to gather information on edible plants and animals, ways of getting water, travel conditions, disease hazards, native lore, reef and surf conditions, and other data to safeguard the lives of downed Navy fliers.*

To survive in a wilderness, with a minimum of physical equipment, could be an interesting experiment or a harrowing experience. How would we find it? We wondered.

Our island was a low coral formation, one of the many uninhabited specks of land that make up Kwajalein Atoll. Some of these atolls, Kwajalein, Eniwetok, Majuro, Mili, Jaluit, and others, stretch over 800 miles of ocean to form the Marshall group.† All of them together contain about 74 square miles of land (map, page 74).

Each atoll is composed of an irregular chain of islets around a central lagoon. The islets are separated by continuous shallow reefs with a deep channel or entrance into the lagoon, usually at the leeward end of the atoll.

An Islet Shaped Like a Dumbbell

This we knew about our islet; what we could see was still more interesting. We could survey it all at a glance. It was shaped like a dumbbell, with the two broad ends densely covered by vegetation and the narrow central strip opening to a coarse sand beach strewn with coral boulders.

A small lagoon nestled between the projecting ends of the islet and emptied into the ocean by a channel through the reef.

A billowy cloud hung over the coconut trees, shimmering heat waves distorted the outlines of objects on the beach, and a rough surf pounded the frontal reef. Now that the war was over it was possible to appreciate the natural beauty of our island.

There were the graceful coconut palms swaying over sandy beaches, the aquamarine blue of the lagoon, the emerald green of tropical vegetation, the shrill cry of white terns and noddies, the booming of the surf, and the gentle whisper of northeast trade winds.

Five of us were going ashore—John J. Lynch, Merle Stitt, Goniske, a Marshallese native, and the authors. As we gathered up our meager equipment our attention shifted from the aesthetic to the practical. We had to live with that island. A glance took in the number of coconut trees; they would be our staff of life. The nut crop was poor. The trees were thin and tall, which meant a long climb for a drink.

Apparently there were no breadfruit trees, but the reef looked productive.

The little lagoon teemed with colored reef fishes, and back of this were many deep tidal pools that served as natural traps for varied sea life. All in all, foraging prospects looked good. We were anxious to get ashore.

We bounced into a rubber raft. A seaman threw our line free and mumbled to a companion, "They can have it." We were on our own.

A Lesson from Earlier Mishaps

Many a castaway in a rubber boat drowned in the surf or received severe coral cuts by landing on the windward side of an island. We pulled toward the calmer lee shore on the lagoon side of our islet. Our raft rode through the surf on the crest of a small wave and when it hit the shallow reef we jumped overboard.

The picket boat was a gray speck on the horizon by the time we had waded the reef and eased our raft up on the beach.

Unloading was simple. Besides personal gear such as a machete, sheath knife, pocket fishing kit, underwater goggles, magnifying glass, flashlight, and tennis shoes, we had a first-aid kit, several cameras, notebooks, and a few reference books on plant and animal life of the region.

Then, too, we had Goniske, who had survived on the islands during the Japanese occupation. We had included him in our party as a sort of reference book from whose wartime pages we hoped to learn some new tricks.

The natives of any area know from generations of primitive living the simple, easy ways of utilizing the resources at hand. Goniske was no exception. Besides, he proved to be a real companion and our most useful piece of "equipment," a skilled coconut husker.

* See, in the National Geographic Magazine, "They Survived at Sea," by Lt. Comdr. Samuel F. Harby, May, 1945.

† See "Map of the Pacific Ocean and the Bay of Bengal," issued as a supplement to the National Geographic Magazine, September, 1943.

Kwajalein, a Minute Dot in a Watery Waste, Lies in the Center of the Marshalls

Total land surface of the 34 atolls and islands is estimated at 74 square miles, about one-sixteenth of the area of Rhode Island. Total sea area is roughly 375,000 square miles, or about one and one-half times the size of Texas. Spaniards discovered the archipelago in 1526, and in 1885 it became a German protectorate. Japanese rule began in 1914 and ended early in 1944, when American forces landed. Like the Marianas and Carolines, the Marshalls are now under United States Navy civil affairs trusteeship.

Our immediate tasks were to select a camp site and to reconnoiter. Accordingly, Lynch and I (John) set out to explore, while Goniske, Merle, and Frank determined where we could construct our palm beds and shelters.

Selecting a Camp Site

An hour of easy walking took us around the island, enabled us to cross it twice, and gave us ample time to wade the reef. When we returned to the raft, Frank and Goniske were busy cutting palm fronds. Their camp site was a good one—shaded from the noon sun and open to the trade winds. Coconut trees, our main source of food, water, and shelter material, were directly behind.

The lagoon lay close to the left, while off to the right were the tidal pools. Firewood of old coconut husks and dry guettarda limbs was easily available.

Our site was a beautiful spot between the palms, but more important, its nearness to all the essentials would lighten our work and enable us to conserve energy.

Conservation of energy is essential to survival under primitive conditions. The task of supplying oneself with food and water, constructing shelter and needed utensils is a full-time exhausting job under the best of conditions.

Hard work requires adequate fuel for the body, and in the primitive life the attainment of food and water is tiring. It is a vicious circle that never relents.

The "lazy native" has by necessity learned to satisfy his basic needs in what appears to be an easygoing way. First rule in survival is to take it easy and make tasks light.

We described the results of our hurried survey to the others. As we had surmised, there was no breadfruit, one of the food staples of the Marshallese. For plant food we could depend on the coconut, the starchy tubers of the tacca plant (Polynesian arrowroot), the golden keys of the pandanus (screwpine) "cone," and if necessary the hard kernel of the ochrosia fruit. We found an ample supply of sprouted coconuts, which prepared in various ways would be our plant staple.

Evidence of Coconut Crabs

Small piles of coconut husks among the coral boulders indicated the presence of giant coconut crabs. There were no signs of any mammals and we had expected none, as bats are the only mammals indigenous to these oceanic islands.

The little white terns and the noddies were nesting. Their eggs would be edible, but we had no intention of using them for food.

The lagoon was full of reef fishes and giant clams. The reef contained various types of edible mollusks. In the tide pools we had seen green parrotfish, needlefish, milkfish, mullet, and a small shark. There was no ration on meat, but we had to catch it.*

Food had not been our only concern. On the ocean side of the island, back of the frontal beach, we had found a sandy depression that appeared to be a promising spot to dig a beach well. We needed fresh water to supplement the green coconut juice and to use in cooking. Rain would help out, but it was an uncertain source.

We had likewise observed the various plants, for in one way or another almost every one had a special use. The narrow-leafed pemphis along the lagoon shore had extremely hard wood that made excellent spears and, like our oak, burned to hot coals. We could use it for broiling fish or lobsters.

The pandanus leaves and prop roots contained tough fibers for lashing shelters. Dry dead limbs from the guettarda tree could be used in making fire by friction (Plate VIII). The velvety leaf of the tournefortia could be used to wrap food for cooking in earth ovens.

* See, in the National Geographic Magazine, "Net Results from Oceania," by Walter H. Chute, March, 1941.

U. S. Navy, Official

Nimbly, They Scamper Up and Down a Wind-bent Coconut Palm in a Marshallese Version of "Tag, You're It"

Climbing the tree is easier than it looks. The youngsters use notches cut by adults who go aloft twice daily to tap flower spikes for their sweet sap, which ferments into toddy (page 91).

John and Frank Craighead

Everyone Gets a "Drumstick" When Octopus Is Served

As prepared by their Marshallese companion, the authors report, this dish was more palatable than it looked. After cooking, the skin with its suction disks was stripped off, leaving an opaque, white, rubbery meat. Members of the Navy party pursued the cephalopods to their underwater lairs (page 89).

Rosettes of shiny scaevola leaves grew close to the sea, forming a light green fringe around the islands. These leaves made a restful bed when covered with palm fronds (Plate V). They served the function of our spruce and fir at home.

The seaside purslane growing in the sand made an excellent green cooked or raw. The coconut had more uses than all the other plants combined.

Coconuts for the First Meal

Our first meal was a simple one consisting entirely of green coconuts. Had we been injured or exhausted, as was the case with many a survivor, we might have been forced to quench our thirst from rain water caught in the coral pockets, and perhaps would have had sufficient energy to husk a sprouted coconut and eat the sweet fluffy core.

Even this minimum expenditure of energy would have been an effort.

Having the advantage of starting out in good condition, we passed up the tiny pockets of warm water in favor of cool, refreshing coconuts.

Frank and Goniske each climbed a tree, "walking" up them very much the way one would climb a tree with spurs (Plate I). They used the rough frond scars to give purchase to hands and feet. Soon it was raining green nuts. A few broke open, spilling the clear fluid, but most remained intact.

When the barrage subsided, Lynch and I proceeded to open the nuts with accurate strokes of the machete. They were excellent drinking nuts, containing a soft thin layer of white meat and a pint of clear, sweet fluid that completely filled the cavity.

After draining a nut we split it with the machete and, using a sharp shoulder of the husk for a spoon, scooped out the soft flesh. Lunch was two nuts apiece with three for Goniske. One can drink freely of the juice of green nuts without ill effects, but the milky juice of the ripe nuts will sometimes cause diarrhea if taken in excess.

Likewise, the soft, flaccid meat of green nuts is far more digestible than the sweet, oily meat of the ripened nuts and in the long run remains more palatable.

We scarcely knew Goniske, yet we could see that he was brimming over with happiness and enthusiasm. A husking stick was needed, and without a word from us he contrived one. He was soon ripping off the tough husks of sprouted coconuts with a precision and ease that momentarily brought us from our various chores to watch with envy and admiration (page 78).

To appreciate Goniske's skill you have to have had experience opening coconuts without a knife or machete. Without a knife there are only two feasible methods of husking them. One is to bash the pointed end of the coconut on a rock or log until brute force triumphs by splitting the husk.

The other way is to use a hard, sharpened stick firmly anchored in the ground to pry off the husk in strips. This requires both force and skill, the amount of force diminishing with practice.

A novice may work for hours and never open a coconut. Goniske did it in seconds. It is not strange that many a downed airman in need of food and water told of passing up coconuts because he could not husk them. Others never lived to relate such simple tragedies.

Throughout the afternoon we gathered palm fronds with which to construct our beds and shelters. A bed and a roof, for a man faced with the necessity of getting food and water and yet conserving his strength, may appear to be a luxury. Under the most critical conditions it would be, for a really exhausted man can sleep anywhere.

In the long run, however, sleep is as necessary as food and drink. With adequate rest a man conserves energy, thinks more clearly in emergencies, and maintains the courage and spirit that alone may bring him through.

Frank and Merle snapped off clumps of scaevola leaves and by inserting the butt ends into the sand laid the foundation of our beds. Goniske and I cut palm fronds, split them along the midrib from tip to butt, and laid them over the scaevola leaves in such a way that the split midrib formed the edge of the bed and the leaflets overlapped in the middle.

Five or six fronds formed a soft, springy bed. These were protected by a shelter of densely shingled, split palm fronds. Our thatched leantos were the essence of simplicity yet adequately rainproof (Plate VI).

Fresh Shark for Supper

We had not taken time to gather any substantial food and now felt the need of a good meal. Although ready for our palm beds, we knew our working day was a long way from being over. At noon Lynch had started a fire with a magnifying glass and a dry coconut husk. Fortunately we had kept it going, for now there was a heavy haze.

Frank and Merle went after more green nuts, Goniske dug an earth oven, while Lynch and I tried our luck in the tidal pools.

The small shark we had seen on our reconnaissance would be our best bet. We waded

John and Frank Craighead

To an Expert, Opening Coconuts Without a Machete Is Easy

Navy annals record cases of wartime castaways going hungry because they did not know the simple technique demonstrated here. Goniske pries off the tough husk in strips by thrusting the nut downward against a hard, sharpened stick anchored in the ground (page 77).

into the clear, refreshing water and slowly herded the shark into a shallow arm.

A sudden rush forced him practically to strand himself on the coral, where a quick stroke with the back of the machete snapped his vertebrae.

Strange how much better we felt now that supper was a certainty.

What heights of feeling some survivors must have experienced at obtaining their first food in many days and knowing that at least for a little while longer there was still hope, still a bare chance that they would come through!

These pools with their trapped fish were emergency larders. They represented a certain amount of security amid the uncertainty of primitive living. Thus, when we had speared a large green parrotfish, we decided that we had our limit.

In localized areas parrotfish are thought to be deadly poisonous at times because of toxic plants and animals they consume.

A lone survivor would do well to pass up such a meal, but our purpose was to experiment, and we felt that Goniske might shed some light on its edibility in these waters. He grinned when he saw our catch; apparently the parrotfish was a delicacy.

Goniske Plays Chef

We were about to clean the fish when Goniske indicated that he would prepare them. He laid each fish on a bed of heated coral stones—laid them on intact, uncleaned.

He did not touch the leathery skin of the shark nor remove the large scales of the parrotfish. He didn't even gut them.

It was a lazy stunt if ever there was one. We were ready for anything that saved effort, but this seemed to be stretching the point. But we all hid our feelings and held our tongues. We knew that Goniske had cooked fish nearly every day of his life and curiosity alone would have kept us silent.

Before long he pronounced the fish ready. He removed the charred skin and cut the fish into sections. The skin and scales had kept the flesh moist, the viscera only added to the flavor, and after the first taste we conceded it was better than our broiled fish would have been, and so simple.

The parrotfish was delicious, but just in case Goniske should be wrong about its edibility in these waters, one of us acted as a control and passed up the delicacy.

Staff Photographer W. Robert Moore

Fortunes of War Make Uncle Sam, Instead of the Mikado, Their Guardian

Future welfare of Marshallese children and adults is guided by United States Navy civil government officials. For youngsters aged 6 to 14, attendance at Navy-supervised schools is compulsory. Subjects include English. Under Japan's 30-year rule, the islanders received limited schooling from American missionaries.

John and Frank Craighead

Shore Dinner Coming Up! Giant Clams of the Pacific Have Built-in Dishes

After a hunt on an atoll reef, John Craighead removes the contents of three Hippopus clams. In his left hand he holds the most palatable portion—the large adductor muscle, which has a plantlike taste. These mollusks were steamed and served in their own shells (page 80).

Before starting to cook the fish we had covered the hot stones of our pit fire with tournefortia and young coconut leaves. On top of these we placed sprouted nuts, put on another layer of leaves, and covered the pit with a foot of sand (Plate VIII).

In two hours the confined heat from the hot rocks baked the coconuts. For our second course we dug up these nuts.

Rotating one in the palm of my hand and successively striking the three longitudinal ribs, I split the nut open, exposing a yellowish-white core about the size of a small potato. It had the taste and consistency of a boiled yam very slightly flavored with soap.

If unopened, cooked nuts will keep three or four days. They are nutritious as well as palatable, since the oil melts into the flesh, forming a rich food.

Goniske Wins Respect

Long after dark, dead tired but no longer hungry, we flopped down on our palm beds. Frank and I shared the larger of the two shelters with Goniske.

All our lives we had been learning to live outdoors. We had roughed it in many parts of the world, but in this environment Goniske was admittedly our superior. We knew and felt it, but he didn't. He hesitated to sleep under the same roof with us and did so only after much persuasion. At supper he waited for us, expecting to eat when we had finished.

We served him equal shares and offered him a second helping; he accepted only when certain we did not intend to eat it ourselves.

We were determined that on our island, at least, he was an equal and would be treated so in every way.

That night Goniske realized he was one of us, and he knew we respected him. From then on nothing was too difficult for him to do if we wanted it done. The knowledge he had accumulated throughout a lifetime was at our disposal.

The following days were full of new interests and new adventures; yet all our energies and activities were directed toward the one problem of foraging.

Very few places in the world are more favorable to such primitive existence. The little island contained all we needed, with most of our wants supplied from the versatile coconut tree and the reef with its teeming animal world.

More than half the trick of obtaining food lies in knowing what to expect in a given area and where and how to look for it.

Each form of life on the reef has its own place where it prefers to live. The brilliant reef fishes are easy to see but difficult to catch. The less conspicuous foods, such as various types of mollusks, crabs, and shrimps, are not easy to locate.

Through necessity we soon learned the best places to gather the delicious cat-eye snails, the giant clams *(Tridacna),* and the large, lustrous cowries. We knew where to expect octopus and what sections of the reef offered suitable homes to spiny lobsters and coral crabs. Much of our time was spent on the reef and in the small lagoon (Plate VII).

Spearing the Giant Clam

One morning four of us donned goggles and with our fire-hardened pemphis spears and sheath knives started out to gather giant clams. We had found two types of large clams: the Tridacna, which attaches itself to coral formations and becomes partially imbedded in the living coral, and the Hippopus, which is free to move about.

Some specimens of Tridacna are known to be a yard long, two feet high, and weigh over 500 pounds. We had heard tales of natives inadvertently stepping between the giant jaws and being held below the surface in that viselike grip.

We swam on the surface, peering down into the depths until we spotted the undulating, iridescent mantle of a small Tridacna.

Goniske rolled over porpoiselike and headed down, knife in hand. I followed with a heavy spear. A light touch on the purple mantle started the valves slowly closing. The clam was a small one, about 40 pounds, and was well imbedded in a large coral head.

After looking this situation over we came up for air, starting down again only when the clam had opened up.

The power of the Tridacna's shell is tremendous, and there is reason to believe that men have met death helpless in its stony grip. However, the valves close slowly, and a cautious man has little to fear.

Swiftly Goniske's knife slid between the mantle until his wrist was deep within the clam. A lightning slash the length of the open valves cut the great adductor muscle, preventing the clam from closing up. A few more quick strokes completely severed it. Taking turns, we swam down and pried with the heavy spear until the clam was free.

Spot Marked for Future Reference

We had found the simplest method of preparing these clams was to steam them in their shell and then use the valves, or shell halves, for dishes (page 79). We attempted to tow this one ashore. A hundred feet of

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Kodachrome by John and Frank Craighead

Up He Goes! Coconut Palms Reward Castaways with Food, Clothing, and Shelter

Every muscle does its bit as John Craighead works his way up a tree on an islet of Kwajalein Atoll.

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Kodachrome by John and Frank Craighead

Under Cotton-wool Clouds, an Atoll Islet Gleams Like a Bit of Jade in a Turquoise Setting

The authors and companions, "guinea pigs" in a Navy survival experiment, spent seven months on such dots of land in the Pacific. This air view shows live coral in a line of reefs paralleling the island. Dead coral, pulverized by pounding surf, forms the beaches.

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Kodachrome by John and Frank Craighead

No Shortages or Priorities Here! Castaways Get Their Home-building Materials from Nature's Stock Pile

Frank Craighead rests beside a shelter shaded by a tournefortia tree and exposed to cool trade winds. Sloping roof was thatched horizontally with split palm fronds, covered with whole fronds laid vertically. A rubber raft (left) brought the party ashore from a Navy vessel.

Pandanus, or Screwpine, Offers Sustenance to the Resourceful Forager

Its seeds distributed by ocean currents, this plant is found on most Pacific islands. Merle Stitt chews a section of its conelike fruit. Leaves make weaving and thatching material; from the prop roots comes cordage.

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Kodachromes by John and Frank Craighead

Tapped Like Sugar Maples, Coconut Palms Yield a Sweet, Refreshing Sap

Liquid drips into a bamboo joint after the end of a flower spike has been severed and bound to prevent the flower from opening. The juice quickly ferments into a stimulating toddy, or "jugeroo."

Micronesian "Know-how" Proves Handy in Weaving a Palm-frond Sleeping Mat

The authors found Goniske, their Marshallese companion, a walking compendium of tips on primitive survival. Here he deftly fashions split coconut fronds into bedding, to be placed over a layer of leaves.

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Kodachromes by John and Frank Craighead

Coconut Crab, Broiled in a Coral Oven, Made Castaways Feel Like Gourmets

These big crustaceans were captured at night, when they emerged from rock crevices to feed on freshly opened coconuts placed as bait. One large specimen made a meal for five. Their meat tastes like lobster.

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Kodachrome by John and Frank Craighead

An Atoll Housing Project Rises in a Lush Tropic Setting Fanned by Pacific Trade Winds

John J. Lynch (foreground) weaves a palm-frond shingle while Frank Craighead places another on a two-man shelter. With proper knowledge and simple equipment, say the authors, a castaway has a good chance of living to tell about his experiences.

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Kodachrome by John and Frank Craighead

Spear in Hand, He Peers Through Goggles at an Underwater World Teeming with Edible Fish

The island reef, here investigated by Frank Craighead, was the source of much food for the Navy castaways. Parrotfish, considered poisonous in some localities, they ate without ill effects. They also dined on shark, octopus, giant clams, and spiny lobsters.

Baked in an Earth Oven, Coconuts Taste Like Soap-flavored Yams

Frank Craighead places leaves over the nuts; next comes a covering of sand to confine the heat. The oven, one of the oldest and simplest cooking devices, consists of a hole lined with heated rocks.

© National Geographic Society

Kodachromes by John and Frank Craighead

Making a Fire with the "Marshallese Match" Is No Job for an Amateur

Here Goniske shows how he produced flame in three minutes with the fire-plow. His equipment is two pieces of dry guettarda wood. The plow stick is rubbed against the grooved stick until smoke rises.

gasping for air as we bobbed up and down with our heavy load convinced us that we would never make the beach. Settling to the bottom, we cut the mantle and severed the other end of the valve muscle.

The white ropelike muscle is delicious raw, tasting somewhat plantlike, and with a sweetish flavor. Goniske and I divided and ate it while resting on a coral head. The large, slimy mantle and a small, brown, fatty bag, which Goniske considered the choicest morsel, were put aside for chowder.

Locating several other clams grouped together on a coral formation, we marked the spot for future needs with the marble-white interior of the opened Tridacna shell. The smooth reflecting surface stood out as an unnatural object on the lagoon floor.

We had barely completed this task when we heard a call from Frank. I swam toward him while Goniske carried our prize ashore.

Through the clear water I could see a dark column of inky fluid extending from the bottom and mushrooming to the surface. Frank had an octopus at bay. We had caught a number of these grotesque creatures with their parrotlike beaks and strangely piercing stares.

Viewed at close range beneath the water and magnified by refraction, they always sent a chill down my back. I think we all felt a little that way, but they were the best of food prepared *à la* Goniske, and we took every opportunity to capture them.

Through the sepia-tinted water I could see that Frank had planted his spear in one, but as usual the octopus was wedged in a crevice with the sucking disks of all eight tentacles holding fast.

This was not the tremendous deepwater octopus that sometimes measures 25 feet across and could easily drown a man. Such monsters are rarely encountered, but the small reef species averaging three and four feet across are common in all tropical waters (page 76).

However, Frank was about to learn that even these small creatures can be dangerous under certain conditions.

Into the Octopus Lair

The water was scarcely eight feet deep. I relieved Frank of the spear, continuing to hold it pressed firmly into the saclike body of the octopus.

The water had cleared, and as Frank swam down I could see two beady eyes and a pair of snaky tentacles that were feeling their way up the spear. His gloved hand slid down the spear between two roving tentacles and forced its way into the coral crack to grasp the body of the octopus.

A cloud of sepia burst in his face and rapidly spread, momentarily concealing him from view. Through the spear I could feel the vibrations of a tugging match going on below. Another discharge darkened the water. The struggle continued.

As the inky substance slowly drifted aside, I could see Frank with his hand still in the crevice, his arm entwined by tentacles, his feet braced against a coral block. He was pulling with all his strength.

Suddenly his hand slipped out of the glove and he shot to the surface, gasping descriptive but not complimentary phrases.

With a firm hold on the body but held in turn by the tentacles, Frank had discovered that the octopus had the controlling grip. Caught short of air, unable to open his gloved fist to pull it out of the small hole, he had nearly come off second best.

By enlarging the cavity in the coral we were able to retrieve the glove and extricate the octopus. Immediately it twined its tentacles around Frank's arm, but we knew how to handle him in open water.

Frank quickly slid his free hand down the length of his arm, breaking the tentacles loose just as you would pry a rubber suction disk off a window pane. Before they could fasten again he turned the octopus inside out, rendering it helpless.

Crabs Captured at Night

The nights frequently proved more productive than the days. Many terrestrial and aquatic creatures move around only after dark. The giant coconut crab and the spiny lobster were two delicacies that kept us foraging into the late hours.

During the day the coconut crabs remained hidden in deep coral crevices. We located their burrows by the piles of old coconut husks, baited the area with freshly opened nuts, and after dark captured the crabs as they came out to feed.

There was a sense of expectancy in creeping among the sprouted coconuts and coral boulders, watching for the shine of crab eyes as our light played over the rough ground and dense vegetation. Sometimes the slow, deliberate movement of the big crabs revealed them to us, or again it would be the sound of one dragging a coconut.

The problem was to secure the crab without losing a finger. A large specimen could nip a chunk the size of a silver dollar out of a fibrous coconut husk or crush a good-sized coral stone to powder.

After locating one, our first task was to cut off his retreat. Then one of us would pin him to the ground with a stick while another would risk his hand by grabbing both tremendous claws just back of the pincers. A strip of dry pandanus leaf was looped around his claws and carapace, and thus suspended he could do no harm.

The activity we most enjoyed was catching the spiny lobster. Perhaps it was because a good catch always left us with a sense of achievement. It might have been because the water on the reef felt cool and refreshing, or because we anticipated the delicious meal following a successful lobster hunt.

Sport in a Strange World

These undoubtedly played a part, but for me lobstering was enjoyable because it was a sporting proposition in a strange and beautiful underwater world that consisted only of the narrow beam of my light. Outside the beam was inky darkness.

My little world moved with me as I swam, constantly revealing new creatures, strangely shaped coral, dark fathomless caverns, the glint of eyes or scales, and then suddenly—it was always unexpected—the gold glimmer of a lobster's eyes.

There are many methods of catching spiny lobsters. The most common practice is to wade shallow reefs at low tide, using a coconut-frond torch. Found feeding in the shallow water, the lobsters are easily captured.

They can be frightened from their daylight crevices with a small octopus fastened to the end of a stick. Seeing this natural enemy invading its home, the lobster backs hurriedly into the open, where it is grabbed by the swimmer.

The most effective method for the reef and waters surrounding our islet was to use a waterproof flashlight and swim among the coral formations until a lobster was sighted. One big advantage of the latter method was that we could catch lobsters at either high or low tide.

Lobstering was always serious business with us, but at high tide it became a real sport. When the channels and pockets were deep, lobsters were more difficult to spot and the littoral currents made underwater swimming hazardous.

To appreciate a lobster hunt you must go on one. Flashlight in hand and fully clothed to protect yourself from coral cuts, you drift with the currents, scanning the bottom as your light reveals it.

You may see the orange eyes of lobsters in three feet of water, looking you squarely in the face. Or, you may discern the outline of one in the purple, murky depths of a pool.

In either case you keep your light trained on your victim while swimming within grabbing distance. Dazzled by the light, the big crustacean will remain motionless for a few seconds.

A lobster swims backwards, so you reach for him from behind. A swift movement aimed at his stern and your gloved hand catches him amidships as he darts backwards to escape. He starts buzzing and flapping his powerful tail as you shove upward toward the surface. You gulp a lung full of air, bring the fighting lobster against your trouser leg and swim for a coral head.

Clasping your trousers, the lobster ceases to struggle, and you relax your grip while groping for the coconut cloth bag tied to your belt. You jerk him free of your trousers, shove him into the bag, and start cruising around for more.

Should you spot one and make a false move, he darts back out of your light beam and the chase is on.

You dive down along a coral channel, turn a corner, and there far back under a ledge you see burning two tiny underwater cigarettes. A shove off the bottom and you are back to the surface. A wave slaps you off balance and carries you with it.

When you get squared away you are not too sure where your victim is. Down you go out of the wave action, and there is your lobster—still motionless. You calculate the best way to approach him and still get back out from under the coral ledge and up through the narrow channel to the surface.

Up you come for a lungful of air, and then down for the "kill." Your light turns the dark water into a fairyland of weird shapes and subdued colors, but your attention is focused on the two burning coals—the lobster's eyes.

Two feet away he looks like an armored tank. You clamp on him, turn around as he "kicks" and buzzes, and then out to the channel and up to the surface.

The fish are less timid at night, and you get an eye to eye stare at the butterflyfish, triggerfish, angelfish, little demoiselles, and large, snooping parrotfish. They are recognizable, though their brilliant colors are much subdued.

Little to Harm an Intruder

When lobsters are scarce, you investigate the varied coral formations. Such grotesque animals as sea cucumbers, spiny urchins, sea slugs, moray eels, and fan worms arouse your curiosity. The reef is truly a new world in the dark, where all familiar life looks different

John and Frank Craighead

Papaya, Fresh from the Tree, Makes a Juicy Between-meals Snack

Like this Marshallese boy, the Navy castaways found the South Seas equivalent of the cantaloupe a succulent adjunct to their diet. The fruit, a native of tropical America, is rich in the enzyme papain, an aid to digestion. The papaya, easily propagated, has been introduced into many parts of the world.

and many purely nocturnal forms are active.

Peering down into caverns that are bluish purple at the fringe of your light, you wonder what is hidden in the dark depths beyond. From experience you know there is nothing in this strange world to harm you.

Sharks and barracuda seldom wander in beyond the reef, the poisonous stonefish and scorpion fish are rare, stingrays prefer sandy or muddy bottoms, and the moray and conger eels seldom attack unless cornered.

In spite of your assurance you investigate with caution and feel an involuntary chill when a large fish suddenly looms into view.

You return to shore tired, with a few lobsters and a thousand mental pictures of the reef, each one a shaft of light walled in by darkness.

Some of our meals were scanty, and we had to rely on the coconut alone for food and drink. On those days we merely ate to live.

When the reef foraging was good, however, we had regular banquets.

Everyone had a share in preparing the food before sitting down to enjoy it. We were always ravenous, and no meal ever tasted better than those consisting entirely of natural products obtained in primitive fashion.

Frequently there were baked or broiled lobster, octopus steamed in the pit or boiled in coconut cream, raw Tridacna, broiled fish, raw or cooked coconut heart, baked sprouted coconuts, some green drinking nuts, and finally a swig of toddy or "jugeroo" (page 75).

This last treat probably involved more work than it was worth, but it tasted fine and

John and Frank Craighead

Majuro Atoll's Calm Lagoon Provides a Safe Haven for a Rakish Marshallese Sailing Canoe

Islanders seldom moor their boats, but haul them up on beaches where marine worms cannot attack the timbers. Hulls are fashioned from hollowed-out breadfruit trunks. Upper portions are made of planks fastened with coconut-fiber cord. Seams are waterproofed with sticky, rubberlike sap of the breadfruit tree.

John and Frank Craighead

Reversible Rigging Enables the Swift Marshallese Outrigger Canoe to Sail from Either End

To change direction, sailors lift boom and mast from a socket on the bow and fasten them in another on the stern. The rudder also is switched. John Craighead and John Lynch (center) display their catch after a fishing trip with native hosts.

John and Frank Craighead

Even a Goldfish Has More Privacy than the Tiny, Transparent Fierasfer

All the secrets of this reef denizen's interior are bared like the works of a watch. To escape voracious larger fish, the fierasfer hides in the body cavity of the sea cucumber, or bêche-de-mer, and emerges only to feed. Such specimens were among many fantastic creatures encountered by the authors as they explored a watery wonderland in search of food.

always gave us a sense of having attained finesse in the art of survival. It was nothing more than fermented coconut sap which we obtained by tapping the coconut flower spikes. The sweet fluid was collected in coconut or bamboo containers (Plate IV). After standing a day or two it had quite a kick.

Goniske Surprises with a Song

After one such supper Goniske surprised us by unexpectedly singing "You Are My Sunshine." He knew the meaning of the word "sunshine" and had a bare conception of the meaning of a few other words in the song. He had memorized words and tune perfectly.

Sitting beneath his beloved coconut trees, facing the setting sun, he sang with great feeling and understanding, as though the sunshine he visioned was the maker of the coconut, the reef, the rain, the trade winds, the toddy, and all the good things that made up his world. Goniske was completely happy.

Many forces operate against a survivor to reduce the length of time he can live. Food and water are always critical, but other factors such as warmth, shelter, and disease may also be hazardous. Armed with proper knowledge and simple equipment, a survivor has more than an even chance of living to tell about his experiences.

Over a period of seven months we visited many mid-Pacific islands and found the survival problems much the same on all. In its simplest form, survival on the oceanic islands and along tropical seashores consists essentially of understanding a few basic woodcraft principles and techniques, knowing how to make full use of the coconut, and how to get sea food from the reef.

During the early stages of the war men thrown entirely on their own resources in wilderness areas died of thirst with fresh water only a foot beneath the surface of the sand. They hungered with food in sight.

In many cases the difference between life and death, or between mildly rough going and extreme hardship, was the lack of a little knowledge or training, the simple kind of knowledge that governs the lives of Goniske and his people.*

* See, in the National Geographic Magazine, "Hidden Key to the Pacific," by Willard Price, June, 1942; and "Our New Military Wards, the Marshalls," by W. Robert Moore, September, 1945.

Fun Helped Them Fight

By Stuart E. Jones

IN THE SPRING of 1943 I strolled through a hangar at Langley Field, Virginia, and paused to watch a ground crew preparing a B-24 Liberator for its flight overseas. On the bomber's nose one man had outlined the figure of a girl and, under it, the syllable "Friv." He seemed perplexed.

Finally, he turned to me and asked: "How do you spell 'frivolous'?"

I spelled it out for him.

"You mean an *o* instead of an *i* after the *v*?" he asked.

"That's right," I said.

The artist shook his head doubtfully. I moved on, wondering idly whether he would check my word against Webster's.

A few days later I boarded another Liberator and flew to Port Lyautey, Morocco. Still later, passing through Algiers on my way to Sicily and Italy, I stepped out of a plane at Maison Blanche Airport and was confronted by a familiar sight.

It was only another B-24, squat and formidable like all the rest, but on its nose was painted, in curly letters, *Frivilous Sal*. Over the name was an arresting portrait of *Frivilous Sal* herself.

This was my introduction to the Army Air Forces' informal method of naming and decorating its combat aircraft.

A few of these same aircraft may be seen today, standing in vast, forlorn ranks on lonely fields in the south and west. "Surplus property," or "winged white elephants," the War Assets Administration calls them. Most have vanished; the rest wait until the scrap metal contractor comes with his bulldozers and cutting tools.

Your Saucepan May Have Seen Combat

If you have bought a new saucepan lately, it may contain a bit of aluminum alloy from *Frivilous Sal*.

Some of these obsolete warhorses met a less ignominious fate. They became war memorials. Athens, Georgia, requested the unfinished B-29 Superfortress *City of Athens* from the Air Forces for display in its aviation memorial park. Seattle received *Five Grand*, the 5,000th B-17 built in the Boeing plant there. Los Angeles claimed another famous Fortress, *The Swoose*, piloted by an Angeleno and named for a mythical creature which was half swan and half goose.

Many aircraft nicknames had hidden meanings known only to the men from whose brains they sprang.

For example, what about *Jeiavad*? The word is composed of the first-name initials of the wives or sweethearts of seven members of a B-17's crew. If the remaining three had had wives or sweethearts, the name would have been longer and perhaps even harder to pronounce.

The "Ball Boys" were a Fortress squadron commanded by Col. Clinton F. Ball. While training at a Texas base before going overseas, the commanding officer named his own B-17 *Linda Ball*, after his infant daughter. The squadron went into combat in planes dubbed *Cannonball, Snowball, Meatball, Fireball, Screwball, Speedball, Highball, Eightball, Foulball,* and *Spareball*.

The crew of a B-17 piloted by 1st Lt. Robert C. Mason were happy to be known as *Mason's Morons*.

Another B-17 automatically became *Dry Martini* and its crew the "Cocktail Kids," since the pilot was Capt. Allen V. Martini.

The "Cocktail Kids" added spice to the dry language of mission reports when they returned from an attack on a Luftwaffe plane storage and repair center at Romilly sur Seine, near Paris. Back in England, the "Cocktail Kids" reported: "We hit the target sur le schnozzle."

"Yankee Doodle, I and II"

Yankee Doodle was one of the first Fortresses to attract public attention. On August 17, 1942, Gen. Ira C. Eaker, then commander of the Eighth Bomber Command, rode in this 97th Bombardment Group plane in the first all-American attack on a European target, the German-held railway yards at Rouen.

Almost two years later, General Eaker, commanding the Mediterranean Allied Air Forces, flew in another B-17, *Yankee Doodle II,* on the first shuttle mission from Italy to a base in Russia. Axis targets were bombed en route.

Bad Penny was a bomber that always came back. *Patches,* another Fortress, lived up to its name when it limped back to England from an attack on Kassel with almost 1,000 holes and with four of its crew wounded.

In giving their planes distinctive nicknames, pilots and crews seemed to feel that they thereby imparted some of their own personality to the ship and made it superior to all others. This morale factor may have been the reason why the bestowing of nicknames remained one of the few military activities not hedged about by rules and regulations. The official attitude seemed to be: "We don't care

what they call them, so long as they fly them and deliver the bombs."

But the "high brass" was forced to take a hand in the case of *Murder, Inc.* A Fortress by that name was shot down over Germany. Members of the crew, captured after parachuting to earth, were found to have *Murder, Inc.* blazoned across the backs of their jackets. It was an inadvertent gift to the late Dr. Goebbels' propaganda machine, an opportunity to charge that a band of self-styled "murderers" was bent upon wholesale slaughter of German citizens.

A high headquarters promptly directed that in the future no airplane be given a name that could be used to the enemy's advantage.

As for excessively ribald nicknames and pictures celebrating feminine pulchritude, a few half-hearted attempts were made to induce airmen to shun them in favor of more dignified decorations suitable for reproduction in hometown newspapers. These efforts generally came to naught, possibly because more pressing matters demanded attention.

Names were usually chosen by vote of officers and men in accordance with the democratic system under which bomber crews lived and fought. But sometimes the naming was done with happy-go-lucky informality. For instance, a pilot might wake to discover his plane named in honor of the crew chief's best girl, with her picture in four colors on the nose—and might just let it stand.

Fighters, reconnaissance planes, and transports, too, gloried in nicknames, and the custom prevailed in all theaters of war.

Regional pride was reflected by planes labeled *Texas Tornado, Arkansas Traveler, Brooklyn, Connecticut Yankee, Idaho Potato Peeler, Maryland, My Maryland,* and dozens of others.

Comic strips, favorite literature of the GI's, inspired many decorative motifs. One Fortress squadron named its bombers in honor of *L'il Abner, Daisy Mae, Moonbeam McSwine,* and the other citizens of mythical Dogpatch.

There were many *Sad Sacks,* tributes to the popularity of the harassed little soldier who suffered his weekly humiliation in Sgt. George Baker's *Yank* cartoons.

Likenesses of Sgt. Bill Mauldin's cartoon characters, "Willie" and "Joe," also became airplane adornments. A medium-bombardment outfit based on Corsica called itself the "Dogface Squadron" because the commanding officer had been a "dogface," or infantryman. Mauldin executed a special series of "Willie" and "Joe" drawings for the unit's B-25's.

There were dozens of planes named *Snafu,* a GI expression which has passed into the American language. One of these, a B-17, later was rechristened *We the People.* In more than thirty missions from its English base, it never carried exactly the same crew twice, and no crewman was ever wounded.

One B-26, *Idiot's Delight II,* after smashing targets in France just prior to D-Day, was badly shot up by a swarm of Focke-Wulf 190's. The pilot, Flight Officer Frank M. Remmele, polled his crew on the interphone—and they voted to stay with the ship. By skillful manipulation of his remaining controls, Remmele landed safely at an emergency field.

Other Marauders which piled up scores of missions, often coming home full of holes, were *Incendiary Mary, Frisco Kid, Missouri Mule, I Idalizya, Cornfed Commando, Shu-Shu Baby, Satan's Sister, Impatient Virgin, L'il Po'kchop, Lady Halitosis, Sixovus, Nude Prude, Mild & Bitter, Bossy Lassie, Flak Bait,* and *Pappy's Pram.*

"No-Name" Tribute to Individualism

A B-17 became known as *No-Name.* Its crew was composed of ten rugged individualists. Each had a name he wanted to paint on the Fort's nose. None would give in.

Delta Rebel, with a goateed colonel painted on its nose and a crew of men from the Deep South, fought the first rounds of the air war in 1942. *Delta Rebel II* carried on into 1943, until her pilot, George Birdsong, went home to Mississippi. Veteran crews refused to take over the ship. "George used up all her luck," they said. A crew newly arrived from the States took the *Rebel* on their first mission—and "parachutes were seen to open."

One of the most indestructible bombers was the B-17 *Hell's Angels.* It wore out sixteen engines, five sets of brakes, three landing gears, countless tires, superchargers and oil-cooling systems. *Hell's Angels* outlasted two combat crews, but came home for a morale tour with its original ground crew of six sergeants, four of whom had painted girls' names on the engine cowlings.

As the war in Europe drew to a close, inventiveness declined and more nameless planes appeared, their metal shining and bare of camouflage paint. One new bomber arrived in Italy with the legend *Eat at Joe's* on its nose—a sort of tired comment on the whole practice of nicknaming airplanes.

After V-E Day, the Air Force units in Europe began packing for redeployment to the Pacific. Their plans—and the world's future—were changed when atomic bombs fell on Hiroshima and Nagasaki from a couple of Twentieth Air Force Superfortresses named *Enola Gay* and *The Great Artiste.*

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Kodachrome, U. S. Army Air Forces, Official

A Flying Tribute to Its Builders and Ground Crew Was "Nine O Nine"

This B-17 flew more than 100 missions. Its name came from the last three digits of its serial number. At an English base a ground-crew man adds another bomb to the rows signifying missions completed; others work on chin turret and engine. With peace, thousands of such craft became winged white elephants.

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Kodachrome, U. S. Army Air Forces, Official

If Jap Pilots Had Read American Comic Strips, They Might Have Given "The Goon" a Wide Berth

This hard-hitting B-24 Liberator wears symbols of 16 victories over Nipponese aircraft below its top turret. Under the pilot's window are bombs signifying 24 missions. The plane was named for a cartoon character invented by E. C. Segar, also credited with "jeep."

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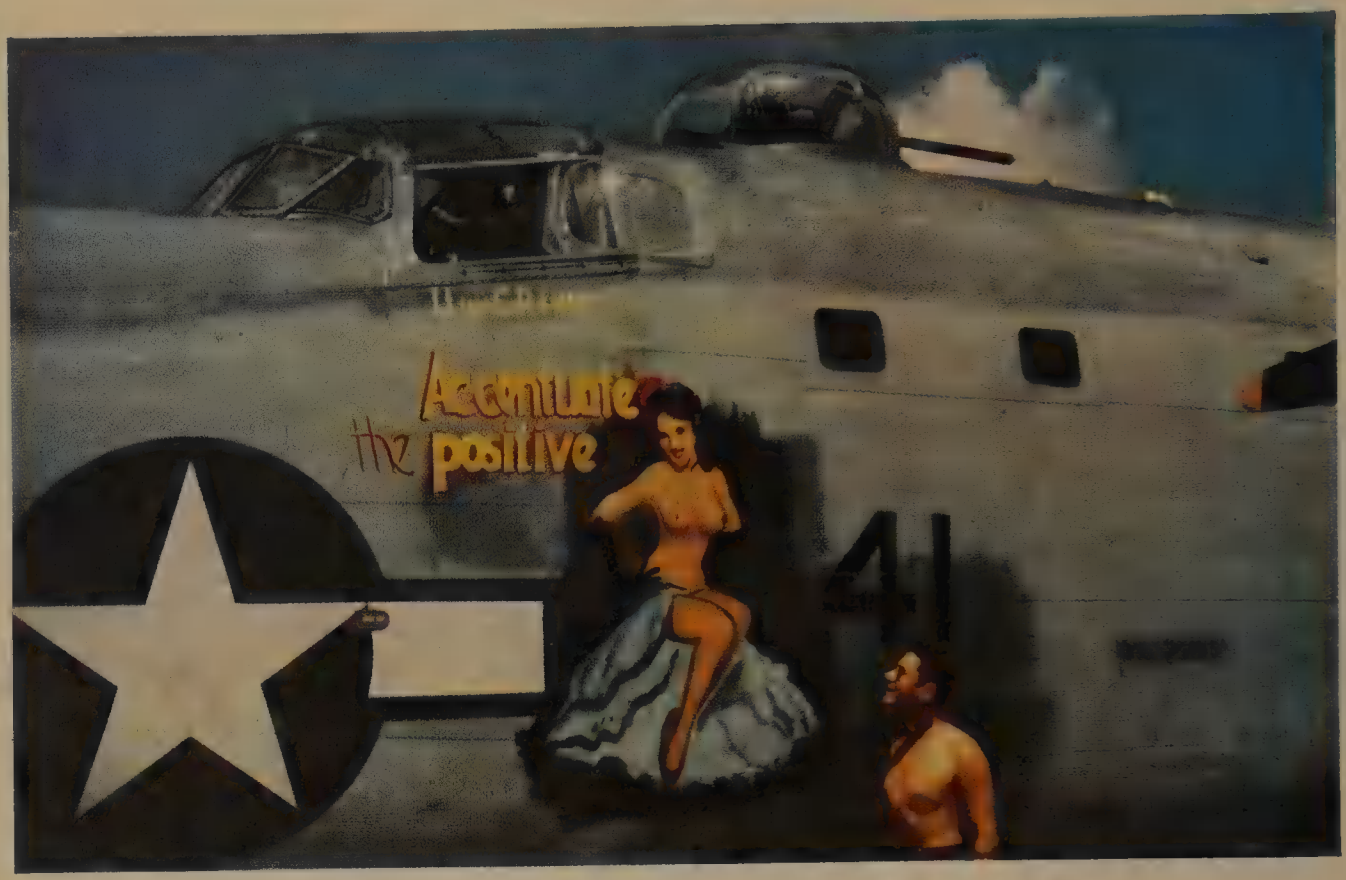
The Language of Scholars Provides a Bomber's Name

"Ave Maria," Latin for "Hail Mary," adorns the nose of a Twelfth Air Force B-25 Mitchell with 103 missions to its credit. The pretty signorina's picture is in keeping with the plane's field of operations—Italy.

Kodachromes, U. S. Army Air Forces, Official

"Idiots' Delight" Passes Its 50-mission Milestone

The sergeant adds an extra-large bomb to this Flying Fortress' helter-skelter array, while the crew chief looks on. At top, two rows of swastikas testify that 14 German aircraft fell before the guns of "Idiots' Delight" in combat.



Airborne Pin-ups Helped the Navy Make Pick-ups at Sea

Nicknames of many bombers, like this Tinian-based PB4Y Privateer, came from popular songs. The Navy used Privateers for antisubmarine patrol, strikes against shipping, and air-sea rescue work.

© National Geographic Society

Kodachromes by R. Wallace Teed

"The Great Artiste" Dropped the Climactic Bomb of World War II

On August 9, 1945, this B-29 Superfortress dropped an atomic bomb which devastated Nagasaki, three days after a similar fate befell Hiroshima. On August 14, almost four years after Pearl Harbor, Japan surrendered.

© National Geographic Society

Kodachrome, U. S. Army Air Forces, Official

"Balls o' Fire" Fought from Tunisia to Italy

Historic targets of the Mediterranean campaign, beginning with Sfax and ending with Rome, are listed on this B-25 Mitchell's fuselage. Over the heads of the crew are painted bombs symbolizing 48 missions. The helmeted figure, with Hitler sprawling in his wake, resembles "Ole Bill," World War I cartoon character.

© National Geographic Society

Kodachrome, U. S. Army Air Forces, Official

"Sweet and Lovely" Was Its Name—Deadly and Destructive Its Errand

Happiness at being back on the ground again, after a trip over enemy territory, is reflected in the faces of this B-17's crew. The swastika stands for an enemy plane downed, the bombs for routine missions, and the triangles for attacks on rocket-bomb launching sites on the French coast.

© National Geographic Society

"Hookem Cow" Wears Machine Guns for Horns

Twin .50-caliber weapons protrude from the nose turret of this B-24 Liberator, resting at its wartime base in England. Jutting from the fuselage behind the mechanic is the Pitot-static tube connected with the air-speed indicator.

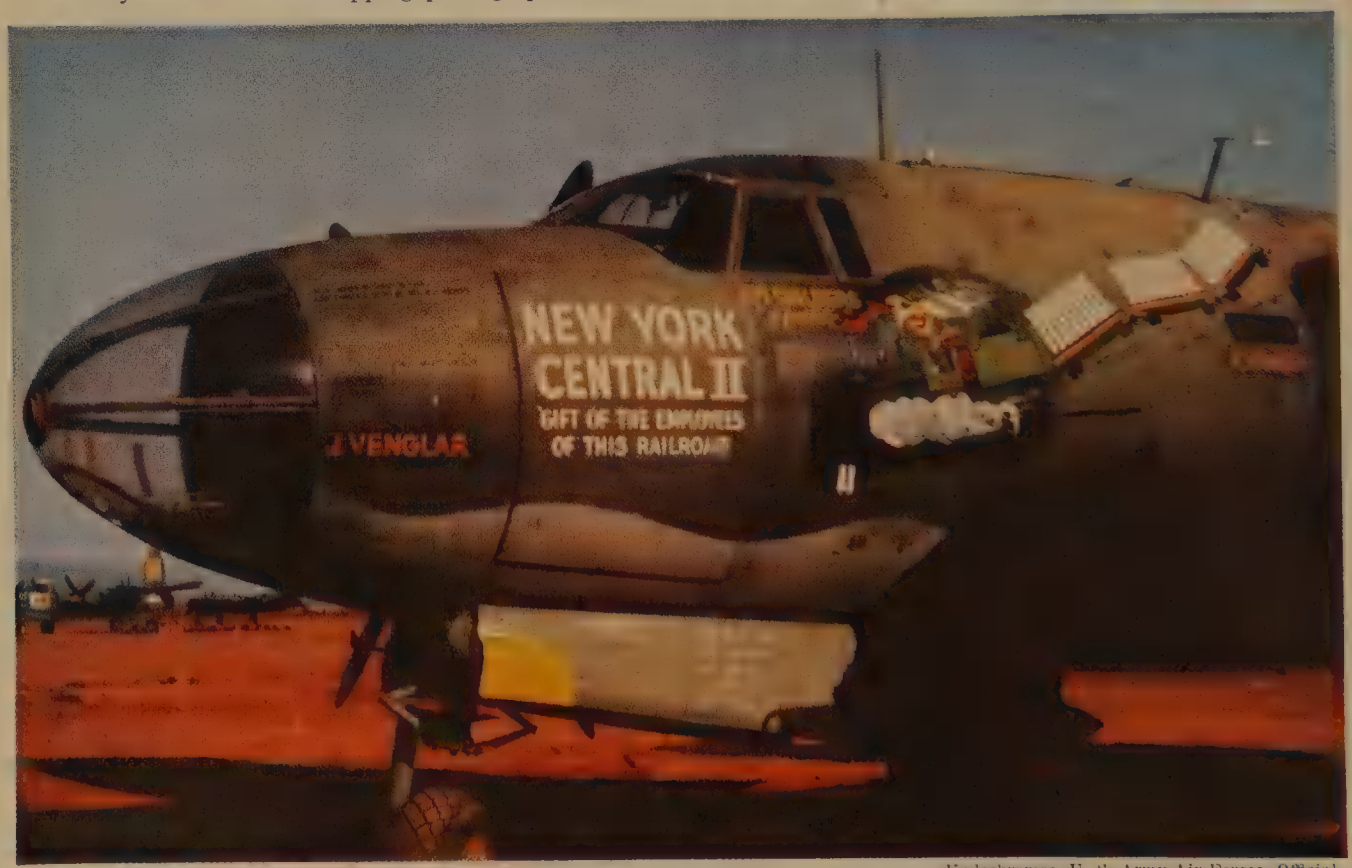
Kodachromes, U. S. Army Air Forces, Official

A Cloud-dwelling Angel Rides a Swift Thunderbolt

The mechanic adds a last touch before sending "Miss Behave" out on another mission. With "art" like this pilots strove to outdo each other in originality. The custom of nicknaming aircraft prevailed in all theaters of war.

Map Making at 20,000 Feet Was "Picture Packing Mama's" Job

Instead of guns, this F-5, a modified P-38 Lightning, carried three cameras in its nose. By the trimetrogon process, they turned out overlapping photographs which became charts for the plotting of bomber missions.



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Kodachromes, U. S. Army Air Forces, Official

A Marauder Carried a Famous Railroad's Name into Battle

Many B-26s and other bombers were presented to the Air Forces by home groups such as the New York Central employees. Precision bombing was a specialty of the Marauder.

"Pyramids" of the New World

By Neil Merton Judd

WHEN Antipater of Sidon compiled his list of the Seven Wonders of the World, he included the Pyramids of Giza but not those of Cholula and East St. Louis.

The Pyramid of Cholula, in the State of Puebla, Mexico, bulks larger than any other in the world. It covers three and one-half times the area of Cheops's famous monument at El Giza but is less than half as high.*

In the suburbs of East St. Louis, Illinois, Cahokia Mound likewise occupies more space than the largest Giza pyramid.

New World "pyramids," built by the ancestors of living American Indians, were constructed of earth or rubble faced with dressed stone or stucco. Where stone was lacking, as in the highlands of Mexico and the desert foothills of the Andes, mud bricks were commonly substituted.

But the fundamental difference between New and Old World pyramids is their function. Egyptian pyramids were tombs; those in the Americas, temple foundations. As such, the latter were necessarily truncated, or flat-topped. And those within the present United States were invariably accompanied by one or more conical burial mounds.

These burial mounds, as in the case of the Egyptian tombs, became an early attraction for treasure seekers.

In the New World, however, curiosity and scientific interest rather than cupidity spurred these men on. Otherwise, experience would soon have taught that Indian burials were accompanied not by gold and precious stones but only by earthenware vessels, shell beads, flint arrowheads and knives, and like objects of little monetary value.

Moreover, the Indians, unlike the Egyptians, had no elaborate method of preserving their dead. Among certain Indian tribes it was customary, by burial or otherwise, to remove the flesh from a corpse.

At prescribed intervals the principal bones from all such individual graves were gathered up for reinterment in a community pit, or ossuary. Thus an archeologist seeking to retrieve and interpret the unrecorded history of the "pyramid" builders finds the job difficult.

New World "pyramids" are found in a variety of forms from Peru to the Canadian border. They range in shape from the high, steep temple foundations of the Maya, through the colossal pyramids of the Aztecs and their predecessors, to the huge, broad earthworks found in the United States.

North of Mexico these aboriginal pyramids are found chiefly in the wide valley of the Mississippi River and its tributaries.

"The Mound City"

St. Louis was once known as "the Mound City," from the number and character of its Indian remains. Most of them had already been obliterated, but 27 still remained at the north end of town in June, 1819, and were surveyed by members of Maj. Stephen H. Long's exploring expedition.

The task offered welcome respite from inactivity while they awaited repairs to their stern-wheeler, *Western Engineer*.

Gen. William H. Ashley, famed in the fur trade, built his palatial residence on a mound overlooking Broadway. Col. John O'Fallon, soldier, merchant, and philanthropist, selected another as the site of his mansion on lower Bellefontaine Road. The quantity of human bones unearthed during grading operations suggests O'Fallon's mound as an ossuary.

The "Big Mound," at the corner of Mound Street and Broadway, was best known. From it a street was named and the old Mound Market. For fifty years it had whetted the curiosity of passers-by (page 110).

When the mound finally was removed, in 1869, it was found to cover a burial chamber 8 feet high and more than 70 feet long. At least 20 bodies had been interred in the vault, but none survived the wreckers and souvenir collectors. All knowledge of the tombs' contents has been lost.

As St. Louis continued to expand and its Indian mounds vanished one by one, the advisability of preserving typical examples was advocated repeatedly. Finally, in 1870, the commissioners looked with favor upon a series of small mounds in Forest Park, "a few miles west of the city."

Of this series, the last two were razed preparatory to the Louisiana Purchase Exposition of 1904. Today a single mound stands within the borders of St. Louis, and that is in the southern part of the city overlooking the Mississippi.

Across the river and only six miles away are the remnants of the famous Cahokia Mound group. Here, in the heart of that extraordinarily rich agricultural area known as the "American Bottom," was an important Indian religious center.

* See "Daily Life in Ancient Egypt," by William C. Hayes, National Geographic Magazine, October, 1941.

In 1834 an Englishman, G. W. Featherstonhaugh, counted 60 mounds in a day's walk from St. Louis to Cahokia Creek and back again. He surmised that the larger elevations were refuges in time of flood.

Actually there were 67 major mounds in the assemblage and uncounted lesser ones. Most of these have since been razed or greatly reduced. The Powell Mound was steam-shoveled in 1931 to provide soil for a truck garden. When real estate goes up, Indian mounds come down!

Great Cahokia dominates the group. Its dimensions were recorded in 1882 as 998 feet north and south by 721 feet, by 99 feet high. Maximum height was reached in a succession of four unequal terraces (page 111).

A 16-acre Structure

Largest prehistoric earthwork in the United States, Great Cahokia occupies a little more than 16 acres. Its bulk has been estimated at about 21,690,000 cubic feet. Someone has calculated that, using only the simple tools available to its builders, construction of this single, loose-earth mound would have employed 1,000 Indians nearly five years.

Successive owners have contributed to the changing profile of Great Cahokia. In 1811 Trappist monks were growing vegetables on the lowest terrace; wheat on the upper two.

The whole top, about an acre and a half in area, was leveled off in 1830 or 1831 by a mechanic who liked the view and decided to build his home there. He constructed a wagon road up the west side and dug a well through the second terrace. A later owner drove a tunnel toward the heart of the mound just to see what was there.

Tunnel, well, and cellar walls showed *how* Cahokia was built, but not *why*. Its bulk consists principally of black humus, but here and there are conspicuous lenses of sand, tawny loess, or yellow clay.

As clearly, therefore, as if the construction had been recorded by motion pictures, we see men, women, and children at near-by pits filling baskets with rich bottom-land soil, clambering up to dump their individual loads on the growing pile, and returning for another basketful.

A few stragglers wander farther afield to sandbanks or wind-blown accumulations offering easier digging.

Omaha Indians have a tradition that their forefathers once lived where St. Louis now stands. Other Siouan-speaking peoples claim southern Ohio as their ancestral home.

Among archeologists, Ohio is celebrated for the number and variety of its prehistoric earthworks. In 1848, in the first volume of the Smithsonian Contributions to Knowledge, E. G. Squier and E. H. Davis estimated 500 Indian mounds for Ross County alone; 10,000 for the entire State.*

Well-known Ohio cities occupy the sites of Indian villages. Marietta is one such; Cincinnati, another. Chillicothe stands in the middle of Ohio's Mound Builder area.†

On the northern edge of the city 23 restored tumuli are included in a park of 13 acres. The group at Marietta was surveyed by Gen. Rufus Putnam in 1788 and set aside by his fellow pioneers for preservation.

When whites first crossed the Allegheny Mountains to build new homes, the Mississippi Valley was occupied by diverse Indian tribes. Some hunted the buffalo, but others depended upon harvests from their fields. Some erected mounds; others did not.

Indian mounds, big and little, were everywhere. The latest Post Office Guide lists more than 30 cities and towns that take their names from Indian mounds in 17 States.

Moundsville, West Virginia, carefully guards its principal bond with the past. Here, as if a hub about which the city daily turns, is the famous Grave Creek Mound. It is a conical mound, largest of its kind in the United States, and formerly measured 320 feet in basal diameter by 70 feet high.

In 1838 its owner, unable longer to curb his curiosity, dug a shaft down through the center and tunneled in from the side. His reward was the finding of two log burial vaults, one on the base line and the second 30 feet above.

But Grave Creek Mound is remembered less for itself than for an inscribed pebble alleged to have been found during the 1838 excavations. Its inscription imitated that on Mr. Pickwick's celebrated discovery of a few weeks before: "Bil Stumps stone Oct 14 1838." Dickens' *Pickwick Papers* had at least one contemporary reader in Moundsville!

On one of the three red hills at his home town in Tidewater Virginia, Powhatan erected a mat-covered temple for protection of his idols and the bones of his forefathers.

Thomas Jefferson Studied Mounds, Too

A few miles from Charlottesville Thomas Jefferson in 1780 excavated a mound 40 feet in diameter and 12 feet high. It covered the

* See "Ohio, the Gateway State," by Melville Chater, National Geographic Magazine, May, 1932.

† See "Indians of the Southeastern United States," by Matthew W. Stirling, National Geographic Magazine, January, 1946.

International

For President Truman the Pyramid of the Sun Was a Sermon in Stone

Visiting the famous Mexican site in March, 1947, the President said the world must have peace or our civilization may share the fate of those which Teotihuacán's vast pyramids represent. Gigantic Pyramids of Sun and Moon have amazed visitors since the days of Cortés (page 116). Viewed from Sun Pyramid's base, aboriginal religious processions mounting these west-side steps seemed to disappear into the sky.

bones of an estimated 1,000 secondary burials. Indians traveling the State road six miles away turned through the woods to pay brief tribute at this memorial to those who had gone before.

The first Protestant school in Georgia was built in 1736 on top of "Irene Mound," five miles from Savannah (page 115).

Where Pumpkinvine Creek joins the Etowah River a few miles south of Cartersville, in Bartow County, Georgia, three prominent mounds and several smaller ones mark the site of an important prehistoric Indian village. Its landward approach was protected by a moat 35 feet wide and 17 feet deep.

The largest of these mounds is a truncated pyramid now 61 feet high, covering about three acres. Annual plowing has destroyed every vestige of the building that once stood on its flat top. Here, during their long war with the Creeks early in the 19th century, the Cherokees are said to have built a palisaded refuge for their women and children.

Both the Cherokees and the Creeks were mound builders, even within the historic period.

As described by James Adair, the British trader, Creek towns crowded about a central plaza where their most important ceremonies were performed and where Creek men played their famous game, *chunkey*.

The town house stood on a circular elevation at one end of the plaza; the temple, on a rectangular mound at the opposite end. A like arrangement obtained in Natchez towns of southwestern Mississippi.

McGill from Atlanta Journal

Steel-reinforced Concrete Caps the Smoke Hole of a Ceremonial Earth Lodge in Georgia

Otherwise, this scientific restoration would make Mound Builder chiefs feel at home. Stocky supports stand in original postholes. Roof duplicates original even to charred timber ends. This ceremonial and council chamber, 42 feet across, was underground except for roof covered by clay mound. Site is Ocmulgee National Monument.

The Natchez were sun worshipers; within their temples, walled and roofed with matting, a fire burned perpetually in honor of the sun. Each chief was known as the Great Sun, and the bones of deceased chiefs were carefully cleaned for preservation in the temple.

William Bartram, the American naturalist who traveled many Indian trading paths during the last half of the 18th century, tells us the Choctaws placed their dead on individual scaffolds 18 to 20 feet high.

After a time the bones were gathered up, cleaned, dried, and carefully laid in a special box in the "bone house." On a designated day each family carried its box to a predetermined place where all were piled and covered with earth. A feast followed this communal service.

The several Timucuan tribes of northern Florida heaped sand over their mass burials. One such mound, 16 feet high and at the southern end of Lake George, was named "Mount Royal."

McGill from Atlanta Journal

She Stoops to Enter Where Indian Women Weren't Allowed

This low, timber- and mat-lined entrance tunnel leads into the ceremonial earth lodge, Ocmulgee National Monument. Pattern of woven cane matting duplicates the original. Mound-building Macon Indians, perhaps as long ago as 600 years, held tribal powwows and religious ceremonies in the under-mound chamber (page 108).

When Hernando de Soto put his army ashore at Tampa Bay in May, 1539, he established headquarters in a little Timucuan village, home of Chief Ucita. The chief's house stood upon "a very high mount" near the beach; opposite, across an open square, "a wooden fowl with gilded eyes" stared at the strangers from the temple roof.

During his long, hazardous expedition through our southeastern states, De Soto passed many Indian settlements. Their inhabitants spoke six basically distinct languages. Local customs varied, too, even among related tribes. In Muskhogean towns, elevating the chief's house and the temple upon artificial platforms of earth was a recognized practice.

Living Memorials to the "Black Warrior"

Tuscaloosa, the Black Warrior, whose name is perpetuated by a city, county, and river in Alabama, sat unperturbed on the balcony of his house overlooking the village square in Atahachi, threw back his long feather cloak, and quietly signaled his fan bearer into action as he waited for De Soto and his captains, in heavy armor, to climb up to his level.

Thus from the Mississippi to the Atlantic and from the Great Lakes to the Gulf the same pattern obtained. Rounded or conical

From David I. Bushnell, Jr.

Because of Its Many Indian Earthworks, Youthful St. Louis Was "Mound City" to Steamboaters on Ol' Man River

Big Mound, shown here in an 1840 lithograph, was razed in 1869 as the city grew northward. It gave names to Mound Street and the old Mound Market. Twenty-seven sizable mounds remained in 1819, when members of Maj. Stephen Long's exploring party surveyed them while their boat underwent repairs (page 105).

Col. Dache M. Reeves

Biggest Prehistoric Earthwork in the United States Is the Cahokia Mound in Illinois

Some 350 years ago it was chief of an extensive mound group which, with St. Louis mounds across the Mississippi, formed a great religious center for mid-valley Indians. Scientists estimate building its huge bulk took the equivalent of 1,000 Indians working five years. Air view and trees foreshorten its 99-foot height.

Ohio's "Great Serpent" Glides Its Sinuous Way Through a Smiling Countryside

Probably for religious reasons, some mound-building Indians constructed mounds in the likeness of animals, birds, or even humans. They abound in the upper Mississippi and Great Lakes area. This unusual serpent is 1,330 feet long, 20 feet wide, and from 2 to 3½ feet high. The site is now a State park.

Lt. Col. Albert W. Stevens, Ret.

It Is America's Largest and Most Remarkable Effigy Mound

The tail, at left, is coiled, and the body makes three graceful loops. Scientists disagree about its head. Some see the snake's extended jaws about to seize an egg. Others say the body once continued along the ridge to Ohio Brush Creek (now tree-lined), and the oval is aboriginal method of portraying the snake's heart.

V. De Palma from Black Star

No Mean Engineering Feat Was This Colossal Toltec Goddess

Its pre-Aztec creators quarried, carved, and erected it without metal tools, beasts of burden, or use of the wheel. About 10½ feet high, the goddess tips the scales at nearly 25 tons. Now in Mexico City's National Museum, it stood near the Pyramid of the Moon at Teotihuacán (page 116).

Indiana Historical Society

From an Indiana Mound Came This Aboriginal "Thinker"

Carved from yellow fluorite, the 9-inch figurine is a masterpiece of primitive sculpture. Experts consider it one of the rarest specimens of Indian art to come from eastern North America. Unusual realism shows in features, headdress, and flattened rear of skull.

George R. Foltz

Prehistoric Postholes Blueprint Summit Buildings and Palisades atop Georgia's Irene Mound

Here excavation has reached the fifth of eight superimposed mounds which formed the final hill. Fire basin and wall foundation of summit building of mound 6 remain (B). Mound 6 also had second daub and wattle building (F), and palisade (E) encircled its summit. Palisade (C), building area (A), and molds left by log steps (D) are from mound 5. Fill used to build much higher mounds 7 and 8 shows at left (G). County engineers who needed dirt removed rear of mound in 1911.

mounds, by far the more numerous, were burial places; quadrangular, flat-topped mounds were artificial hills supporting temples or chieftains' dwellings.

A French engineer, Alexander De Batz, visited and sketched the last temple of the Acolapissa, 40 miles north of New Orleans, April 15, 1732, two months after George Washington was born.

What may have been the last great communal reburial service in the Mississippi Valley was held near the present Spiro, Oklahoma, a few generations before Columbus set sail for the New World. To mark the site, a large conical mound and three lesser ones were erected.

In 1933 these mounds were pillaged and their contents scattered. Thus, before qualified observers could come to the rescue, the opportunity to study aboriginal materials of incomparable historical interest had been lost.

The main Spiro mound was built as a sepulcher. It was constructed in three stages and was in reality three separate burial mounds one on top the other. Together, they contained approximately 2,500 skeletons.

The central vault was hung with fabrics made of vegetable fibers, or a combination of fiber and feathers, and of rabbit fur mixed with buffalo hair. Pearl beads were measured by the quart; shell beads, by the peck.

There were implements and ornaments of copper mined near Lake Superior; carved *Busycon* shells from the Gulf of Mexico. Elaborately costumed figures on some of these shells suggest art influences from Mexico or Central America.

Archeologists still debate the question of cultural borrowing in pre-Spanish times between Indian tribes of our southern States and those dwelling south of the Rio Grande.

No one knows when the Valley of Mexico was first settled or by whom. Its legendary history goes back only to A. D. 500 or 600 and the founding city of Teotihuacán. Yet, at the opposite end of the Valley, south of Mexico City, a blanket of lava 12 to 25 feet thick covers the bones and broken utensils of an older people.

Highland Mexico's Oldest Religious Edifice

These nameless older folk built the Pyramid of Cuicuilco, oldest known religious edifice in highland Mexico.* A truncated cone made of clay veneered with basalt blocks, it originally was about 370 feet in diameter and 60 feet high. Four successive enlargements, each enveloping its predecessor, attest the length of time the structure served its congregation.

An open-air clay altar stood on top the Cuicuilco pyramid. Not until the fourth remodeling was the altar roofed over. Postholes in the fifth and final floor evidence a stationary covering, foreshadowing the walled temple to follow.

Teotihuacán, "Home of the Gods," lies 25 miles northeast of Mexico City. It was the principal religious center of the Toltecs until their highland empire fell to the Aztecs about A. D. 1200. Stratigraphic tests in old refuse piles revealed potsherds in the lower levels that archeologists date as early as A. D. 300.†

In the heyday of Teotihuacán its temples, shrines, and priestly palaces extended over an estimated seven square miles. Dominating this vast assemblage were the so-called "pyramids" of the Sun and Moon (pages 107 and 118).

The latter, in ruins, still stands 140 feet high. At its foot is an open square or plaza, northern termination of the mile-long "Pathway of the Dead."

Sun Pyramid stands east of the Pathway and occupies an area of nearly 11 acres. No two sides are of equal length, but they average close to 692 feet.

The Sun Pyramid was built of adobe bricks overlaid with stone and plastered. Its bulk has been calculated at 35,067,596 cubic feet. Exploratory tunnels reveal that the original construction was enlarged three different times by laying a new veneer upon the old. The outermost coating, broken and weathered through long exposure, was removed during restoration in 1905-1910. Thus the basal dimensions given above are probably 25 or 30 feet less than they were at the time of the Spanish Conquest.

To stand at the foot of Sun Pyramid and gaze up at its peak is an awesome experience. Its immensity is overwhelming. Its four triangular sides swim up and away to merge and melt at infinity. They create the illusion of perfectly plain surfaces, but in reality are broken by four terraces.

The uppermost level, on which the Sun Temple stood, lies 212 feet above the basal platform. Its area is over 5,000 square feet. But of the temple itself nothing now remains except the earthen floor. Its walls may have been of stone or wood; its roof, of thatch.

Although of light construction and impermanent, the temple sheltered one of the most important idols at Teotihuacán. It was of stone, 6 feet wide by 6 feet thick, and 18 feet

* See "Ruins of Cuicuilco May Revolutionize Our History of Ancient America," by Byron Cummings, National Geographic Magazine, August, 1923.

† See "Interesting Visit to the Ancient Pyramids of San Juan Teotihuacan," by A. C. Galloway, National Geographic Magazine, December, 1910.

Staff Photographer Richard H. Stewart

Olmec Mounds of Southern Mexico Were Forerunners of Maya and Aztec Pyramids

Olmec, or La Venta, people inhabited the tropical lowlands of Veracruz and Tabasco. They produced one of the earliest high cultures of Middle America, which reached its peak in the sixth century A. D. Eight National Geographic Society-Smithsonian Institution archeological expeditions, led by Dr. Matthew W. Stirling, have probed the mysteries of La Venta man. Here workers of the 1946 expedition cross-section a temple mound in San Lorenzo.

high. It represented the sun and, according to local Indians 50 years after the Conquest, was called Tonacatecuhtli, "the Giver of Life."

The statue faced west, overlooking the ceremonial stairway. An individual standing at the foot of that stairway cannot see the uppermost step. This may, or may not, be a conscious architectural achievement of the builders.

Costumes Lavish and Luxurious

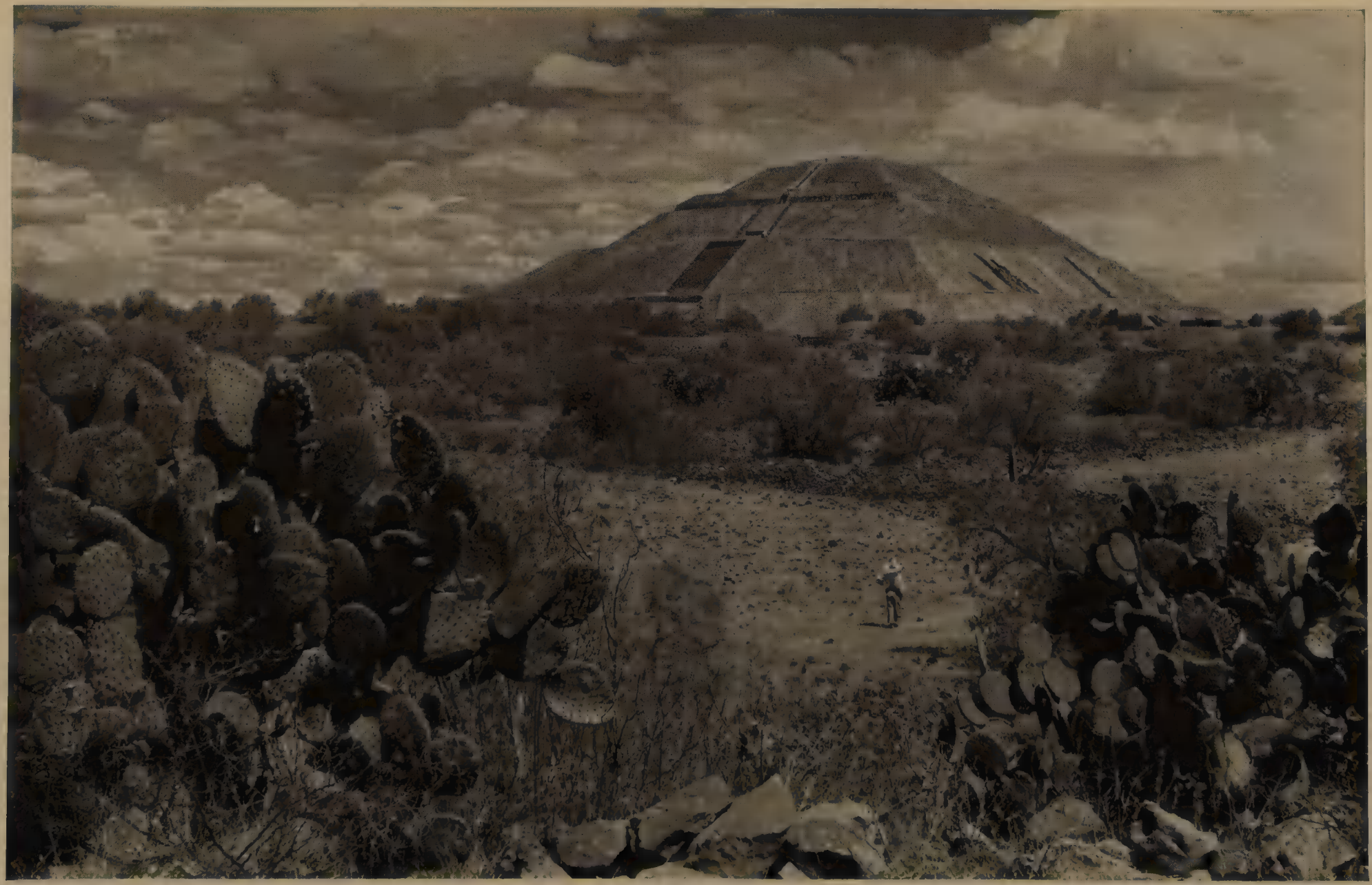
One must retreat a short distance to visualize the scenes once recurrent here—Indians crowding vantage points overlooking the Pathway of the Dead; marching men chanting as they march, blowing on shell trumpets and clay flutes; pennants fluttering from the terraces above; and pungent smoke rolling down from incense pots and braziers.

The baleful notes of a great wooden drum echo out across the valley as priests in sinister black receive the captive and rush him up the steep steps to the sacrificial block.

Aztec codices and wall paintings illustrate the lavish costumes of priests and rulers on important occasions—richly ornamented cotton fabrics and high-booted sandals; capes and headdresses bright with the plumage of tropical birds; jade nose plugs and earrings; necklaces and bracelets of semiprecious stones.

Nowhere in the world, not even in ancient Assyria and Egypt, were religious observances more colorful, more spectacular, than those of Mexico in pre-Spanish times.

Eighteen major celebrations were held annually at Teotihuacán, one at the end of each 20-day month. The great Montezuma is said to have attended these fiestas, borne out from his island city and back in a gilded litter on the shoulders of his nobles.



Staff Photographer Luis Marden

Rising from a Semiarid Plain, Mexico's Mysterious Pyramid of the Sun Is a Vast Monument to Lost Civilizations

An unknown people began its huge mass early in the Christian Era. Enlarged by Toltecs and Aztecs, it remained for centuries the chief feature of Teotihuacán, important religious center of both peoples. Its summit temple stood more than 200 feet above the priestly city and some 50 feet above the near-by Moon Pyramid.

Staff Photographer Richard H. Stewart

Crumbling Pyramids on a Terraced Mountain Mark the Rich Site of Monte Albán, Mexico, Now Being Restored

Teotihuacán survived collapse of the Toltec empire in the 13th century. It was partially rebuilt by the Aztecs and remained an important place of worship. All this is illustrated by new edifices and changes in architecture.

Thus the spade of the archeologist confirms the testimony of resident Indians as recorded by Francisco de Castañeda in 1580.

These same natives also testified that their people were healthier in pre-Spanish times and lived longer because they wore less clothing, married later in life, and ate nothing but tortillas, chili, and beans. When they were boys, so the old men affirmed, only priests and members of the ruling class were privileged to eat wild turkeys, deer, and other game.

At Tenochtitlán, predecessor of modern Mexico City, pyramids and their surmounting temples likewise were prominent features of every view. Towering above the massed green of distant trees, these white *cues* were first to attract the attention of Cortés and his men as they advanced along the causeway from Ixtapalapa, November 8, 1519.

"It was like the enchantments they tell of in the legend of Amadis," wrote Bernal Díaz del Castillo, one of Cortés' most dependable swordsmen.

The worldly Spaniards were amazed at this Indian city-in-a-lake. Its population at the time has been estimated at 300,000. Its houses, built of stone or adobe and plastered over, were predominantly white, although here and there was one constructed of *tezontli,* a pink to purplish-red volcanic ash.

Life in the "Island City"

Life within this island city revolved about a religio-political zone. Here was the Great Pyramid jointly honoring Tlaloc, the Rain God, and Huitzilopochtli, God of War. Here, too, were the Gladiatorial Stone, the Skull Rack, and diverse other structures connected with Aztec religion.*

Completion of this pyramid about A. D. 1490 and dedication of its dual temple was deemed an occasion calling for the sacrifice of no fewer than 20,000 war captives. They had been taken in Oaxaca during a two-year campaign waged for that purpose.

Part of the ceremonial stairway up which those and other thousands were dragged to the sacrificial block may be seen today at the corner of Guatemala and Argentina Streets, only a block from the Cathedral (page 121).

Fray Bernardino de Sahagún, 16th-century authority on the Aztec language and religion, lists 77 lesser pyramid-temples and other buildings in the area immediately surrounding the Great Pyramid.

A mile north of this focal point in Tenochtitlán was the religious center of Tlaltelolco, another island settlement that had its origin in three or four rectangular gardens floating among the reeds.

Huitzilopochtli, the War God, and Tezcatlipoca of the Smoking Mirror, God of Earth and Sky, occupied the chief temple at Tlaltelolco. This stood on a high pyramid dominating the whole public area, an area so spacious it seemed to Bernal Díaz "larger than the plaza of Salamanca."

Four days after Cortés made his entrance into Tenochtitlán he expressed a desire to visit the temple atop the great pyramid of Tlaltelolco. Montezuma insisted upon preceding him and hastily made another sacrifice to appease his gods for the stranger's effrontery.

The Burning of the Human Hearts

When old Bernal Díaz wrote his *True History* long after the Conquest, recollections of that first visit to the Tlaltelolco pyramid were still vivid. He remembered the 114 broad steep steps, the double temple at the top, and the two arched stones on which slaves and war captives were sacrificed.

He remembered the two monstrous stone idols and their terrible eyes, their coatings of gold and pearls, their necklaces representing human heads and hearts. He remembered the wooden roof comb of the temple with its ornamental carving, and the small niche wherein sat the God of Planting Time, said to contain seeds of all the plants that grew in Aztecland.

Most indelible of all, however, was memory of the eight human hearts burning before the two idols, the blood freshly splashed all about, and a stench that reminded the grim warrior of rural slaughterhouses in Spain.

Aztec pyramids were of solid masonry. They contained no interior chamber. Usually they were built of irregular blocks of stone laid in plaster. Older examples were coated with stucco; later ones, with dressed limestone.

Among all the Aztec temples in use at the time of the Spanish Conquest none is more representative than that of Tenayuca, six miles north of Mexico City.

Tenayuca was known to the Spaniards as "the Place of the Serpents." Carved rattlesnakes were everywhere, inside and out. Two huge stone serpents occupied the principal altar; 156 lesser carvings rested on a narrow walk around the temple platform; snake heads protruded from walls and stairways (pages 126 and 128).

* See "In the Empire of the Aztecs," by Frank H. H. Roberts, Jr., National Geographic Magazine, June, 1937.

Hendricks Hodge from Three Lions

Ruins of an Aztec Temple Pyramid Underlie Mexico City's Main Plaza

Center of Montezuma's capital was the Gran Teocalli, a steep-sided pyramid supporting temples to the gods of war and rain. Zealous Spaniards razed the structure, built on its site the chief square and public buildings of their new capital. Aztec ruins also underlie the Cathedral, in background. This corner of the pyramid, where two busy streets meet, is now a public monument.

Altogether, there were at least 800 representations of serpents in and about this place of worship. According to the Mexican archeologists who excavated and restored it, this Snake Temple was rebuilt five or six times.

Life Begins Anew—at 52 Years

Periodic temple reconstruction was one means of attaining the ceremonial purity required by the religion of Nahuatl peoples. On the first day of each year temple furnishings were renewed, dwellings were swept with unusual care, and all kitchen utensils were broken and discarded.

Every 52 years brought a major renewal rite, a spiritual and material rebirth. The old was cast off, and life began anew. Even personal clothing and household furniture were replaced. Temples no less than houses were rebuilt. After burning 52 years the altar fire was extinguished and a new one kindled. From this new fire live coals were hurried to relight the hearth in every home.

The last New Fire Ceremony was held at Tenayuca in 1507, thirteen years before the Spanish Conquest. When that cycle finally came to an end and a new one was beginning in 1559, all the Indian temples in Mexico

had been wrecked and their idols overturned.

Few, if any, religious cities in upland Mexico were more renowned than Cholula. Its patron deity was Quetzalcoatl, the Feathered Serpent, God of Learning and Bringer of Civilization.

Cholula was a holy place, a Mecca, even in early times. Its unknown founders created a religious center by grouping their shrines and altars. Subsequently, this center was half buried beneath a new agglomeration of shrines, altar platforms, and associated structures when Toltec peoples invaded the valley sometime in the sixth or seventh century.

Thereafter, for 400 or 500 years, reconstruction and substitution were recurrent; complete replacement accompanied the New Fire Ceremony every 52 years. Eventually these rebuilding activities filled and overflowed the earlier Toltec temples and courtyards, concealing the whole assemblage under a single colossal pyramid of adobe bricks.

The vastness of this pile is simply incredible. It sprawls over 45 acres, three-and-a-half times the basal area of the largest Egyptian pyramid. Its slopes are so irregular with terraces, offsets, and abutments one can scarcely picture it as it used to be.

The walled churchyard now at its top is 178 feet above the plain. An additional 15 to 20 feet were torn off the apex when a Christian church first replaced the Temple of Quetzalcoatl (page 124).

Mexican archeologists have devoted years to the study of this gigantic man-made mountain. Their exploratory tunnels extend more than a mile through its interior, tracing successive types of construction and changing profiles.

During post-Conquest years schools for the instruction of Indian boys were established here, as elsewhere throughout Mexico.

Cholula Reflects Glories of Past

In these schools friars often drew upon local history to point up worldly lessons. Ever since then Mexican legend has credited Cholula Pyramid, rather than the Tower of Babel, as the place where tongues were confused.

The present-day village of Cholula modestly reflects the grandeur of its past. Amid green and brown fields, white-walled churches stand each upon the former site of an Indian temple.

Here, you are told, one may attend a different church every day of the year. The accepted favorite is that of Nuestra Señora de los Remedios, atop the great pyramid. As was its pagan predecessor, the church is annually the goal of pilgrims from all over upland Mexico.

Actually, of course, the mountain of mud bricks at Cholula is not a true pyramid and never was. A pyramid is a solid designed

From University Museum, Philadelphia

Pyramid-building Maya Carved Aboriginal America's Art Masterpiece

While Europe languished in the Dark Ages following the Roman Empire's collapse, art in unknown America reached a climax in the work of Maya stone carvers. Finest known specimen of their skill is a lintel which decorated a pyramid temple in ancient Piedras Negras, Guatemala.

The lintel, appearing at left in a meticulous restoration, shows priest or chief holding audience with lesser dignitaries. The perfectly proportioned figures suggest actual portraiture. Their natural poses are reminiscent of Greek art. Unusual realism and amazing detail, both evident in the original, compare favorably with similar work of any peoples.

In this lintel the sculptor combined low and high relief with sculpture in the round, creating one of the few known Maya examples of such skill. The chief's extended arm and the heads of squatting nobles were carved in the round.

Some 158 hieroglyphs form the border. Experts deciphered six dates and concluded that this greatest known pre-Columbian work of art had been executed A. D. 761.

The Piedras Negras site was discovered in 1895 and excavated extensively in the 1930's. J. Alden Mason, discoverer of the lintel, described his experiences there in the November, 1935, issue of the NATIONAL GEOGRAPHIC MAGAZINE.

as an individual tomb and having triangular sides meeting in a common vertex. Nowhere in the Americas do we find an aboriginal construction that precisely meets this definition. Many, however, closely approximate it, as for example the Hill of the Sun at Teotihuacán.

A second structure closely resembling a true pyramid is El Castillo at Chichén Itzá, a ruined Maya city in northern Yucatán.

The Castle's pyramidal foundation is 197 feet square at the base and 79 feet high. Its slopes rise in nine terraces and at an angle of 50 degrees. As a concession to art rather than necessity, each side has a stairway.

The risers averaged about 11 inches, or half again the height of steps in North American homes. The north stairway was the most important, since the temple faced that way. Giant serpent heads terminated its balustrades.

A Venerable Maya City

Bernal Díaz del Castillo was a soldier, the only soldier in Cortés's army with a childish whim for counting steps. The Aztec pyramid at Texcoco had 117. The great Cholula Pyramid, with 120, was highest of all. The temple on the chief pyramid at Tlaltelolco, most insatiably bloodthirsty of its time, was reached by 114 steps. Díaz counted them while Montezuma sacrificed a couple of captives at the top.

The venerable Maya city of Copán, in western Honduras, is several centuries older than Chichén Itzá. Its ruins spread over some 12 square miles; the main group of plazas, platforms, and sacred buildings alone covers over 60 acres. Platforms rise irregularly above courtyards, and pyramids rise above platforms.

The religious architecture of the Maya developed independently from that of the Toltecs; yet both featured temples and palaces. For both, the external aspect received most attention. It was the outward effect that was desired.

So-called "palaces," the presumed residences of priests and other officials, were multiple-roomed structures generally on low, stepped platforms. Sometimes two and even three stories were present. Lesser citizens dwelt in one-room huts, thatched with palm leaves.

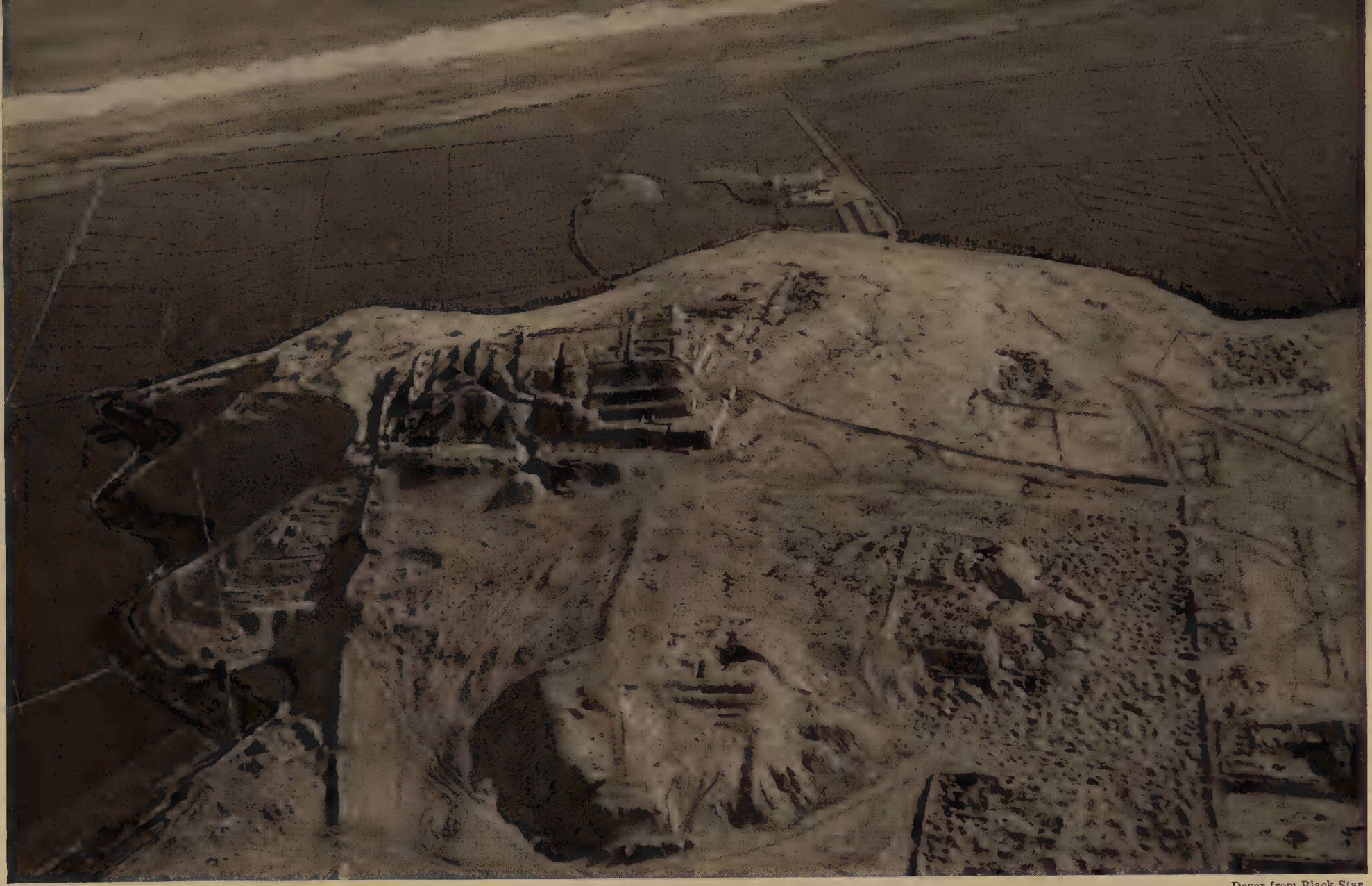
Temples, on the other hand, were never more than one story. They were composed of three essentially independent elements: the substructure, the sanctuary and its antechamber, if any, and the superstructure.

The only conceivable purpose of the superstructure was ornamental. Commonly latticed to reduce weight, it was designed to be viewed solely from the front. Thus the superstructure of Maya temples provided balance and the illusion of spaciousness within, like the

Staff Photographer Richard H. Stewart

Christian Church Replaced Pagan Temple atop the Pyramid of Cholula, Largest of Its Kind in the World

Like its predecessor, the church is a goal for pilgrims from all over Mexico. The colossal pyramid, now time- and tree-disguised, supported an imposing temple to the god, Quetzalcoatl. Invading Spaniards destroyed it and pillaged the flourishing town. Archeologists have tunneled widely through pyramid's adobe interior (page 122).



Dever from Black Star

Conquering Incas Built a Terraced Temple of the Sun to Outshine Pachacamac, Creator-God of Coastal Indians

Its vast, adobe-brick ruins crown a barren hill overlooking the Pacific some 20 miles south of Lima. Once Mecca of the Inca empire, it is today one of Peru's most important archeological sites. Except for Middle America, New World "pyramid" construction reached its greatest perfection along this coast (page 127).

Kurt Severin from Three Lions

Mexican Girls Dance Where Aztec Priests Performed Celestial Rites

Tenayuca's temple pyramid was dedicated to observation and worship of the Sun (page 120). Two coiled, crested snakes on opposite sides of the pyramid were Dragons of Fire. They pointed to the Solstices and showed the deity his heavenly course. Platform is an altar, which may have symbolized the Earth, into which Aztecs believed the Sun fell nightly to illuminate the world of the dead.

false fronts on modern Main Street stores.

The roof crest on the Temple of the Cross at Palenque gave the building an over-all height of about 42 feet, just a little more than the height of the truncated platform on which the temple stood.

Including base and superstructure, several temples at the old Maya city of Tikal, in northern Guatemala, attained a height of 170 feet or more. The highest stands 229 feet and was built in the fourth century. Tikal pyramids are reported the highest and steepest in all Yucatán.*

The Mayans Were Fine Sculptors

Mayan art likewise was essentially a religious expression. To judge from their bearing and elaborate dress, priests and rulers were often pictured, as were visiting dignitaries and prisoners of war.

In ability to portray the human body in profile, Maya sculptors far excelled those of ancient Egypt and the Near East. The court scene on a temple lintel from Piedras Negras, Guatemala, is one of the finest examples of aboriginal art ever produced (pages 122-123).†

Chichén Itzá, abandoned A. D. 692, was re-established in 928.‡ It experienced a phenomenal rebirth and development during the next 200 years. Then war with neighboring Mayapán broke out in 1194. With the

* See "Yucatán, Home of the Gifted Maya," by Sylvanus Griswold Morley, National Geographic Magazine, November, 1936.

† See "Preserving Ancient America's Finest Sculptures," by J. Alden Mason, National Geographic Magazine, November, 1935.

‡ See, in the National Geographic Magazine, by Sylvanus Griswold Morley: "Chichen Itzá, an Ancient American Mecca," January, 1925; "Unearthing America's Ancient History," July, 1931; and "Foremost Intellectual Achievement of Ancient America," February, 1922; also "Home of a Forgotten Race—Mysterious Chichén Itzá, in Yucatán, Mexico," by Edward H. Thompson, June, 1914.

Staff Photographer Luis Marden

High and Steep Were the Temple Pyramids of the Maya

These crumbling ruins were part of the civic and religious center of Uxmal, Maya city of northern Yucatán. Founded about the year 1,000, it was the Athens of a league of city-states which brought to the peninsula two centuries of peace, prosperity, and high cultural attainment. Finest building triumphs of this Golden Age were at Uxmal. Maya built pyramids of rubble and earth, faced with cut stones, some elaborately carved. One-story temples, with window-pierced superstructures, stood on summits.

help of mercenaries from upland Mexico the Itzás were vanquished; their famed city became a prize of the Mexicans.

Under new masters, Chichén Itzá flourished once more. The cult of Quetzalcoatl, the Feathered Serpent, gradually became dominant, and a new religious architecture replaced the old. Special attention was given stairways; they focused attention on ceremonials.

Narrow edgings gave way to wider borders; decorative terminals were added. The Aztecs divided temple stairs with a double rail, balancing the single one at either side; huge, fanged serpent heads formed rail ends for Toltec-Maya stairways.

A relatively late Maya temple at Hormiguero, in south-central Yucatán, features two towers each faced with a purely ornamental stair, the steps have 11⅝-inch risers, but only 4-inch treads.

One of the "palaces" at near-by Xpuhil has three towers, each representing an idealized pyramid. Not only is the front decorated with a false stairway rising at an angle of 80 degrees, but each stair climbs to a false temple surmounted by a false roof comb.

From Mexico southward, the princely edifices of priests and potentates likewise rested on terraced platforms.

A Famous Peruvian Site

Pachacamac is one of Peru's most famous archeological sites (page 125). Its principal temple covers two-thirds of an acre and stands on a hill built of sun-dried adobe bricks.*

When the Incas conquered the city, about A. D. 1400, they spared the temple but built a bigger and better one to their own deity, the Sun. Rising in five terraces up the slopes of

* See "Finding the Tomb of a Warrior-God," by William Duncan Strong, NATIONAL GEOGRAPHIC MAGAZINE, April, 1947.

© Kurt Severin from Black Star

Stylized Rattlesnakes Guard an Aztec Temple at Tenayuca, Mexico

Bared fangs ready to strike, they lie in close formation on a low ledge along three sides of the structure. Painted stucco veneer once added realism. At the end of each 52-year "century" Aztecs rebuilt their pyramids on a larger scale. Tenayuca's, six miles north of Mexico City, was rebuilt five times. Archeologists found under-pyramids well preserved.

the highest natural hill in the vicinity, the Sun Temple covers approximately 12 acres. It, too, was built of clay bricks.

The Sun Pyramid at Moche, more than 130 feet high and 376,000 square feet in area, was also made entirely of billions of mud bricks. At Sipan a temple platform 75 feet high measures about 300 by 900 feet. When stone was lacking, clay was substituted.

Thus, north or south and irrespective of tribe, New World pyramids were foundations for buildings, nothing more. Egyptian pyramids, on the other hand, were superstructures for royal tombs cut in the rock beneath.

The traditional Egyptian tomb was the mastaba, a truncated pyramid of mud bricks overlying the burial vault. King Zoser's (Djoser) famous "Stepped Pyramid" at Saqqara, a novelty in 2700 B. C., was a half-dozen mastabas piled one upon the other, each smaller than that next below. When the resultant steps were filled in with hewn limestone to provide a smooth exterior, a new royal convention came into being.

Cheops's Pyramid at El Giza was the first true pyramid, designed and built as such.

The pyramid-building kings of Egypt ruled between 2700 and 2206 B. C. At that time the Western Hemisphere was still savage. Men lived by hunting and by gathering the seeds of wild plants. Horticulture and animal husbandry were far in the future. So, too, was the idea of a permanent place of worship.

The old Pharaohs had been dead a long while when Cortés, in 1521, laid waste the pyramid temples of Tenochtitlán and Cholula.

'Round the Horn by Submarine

By Comdr. Paul C. Stimson, U.S.N.

THE CREW of the *Sea Robin* watched the sun rise over Cape Horn.

"It was a beautiful sunrise," our patrol report notes. "Weather was clear, and Cape Horn was worth coming 5,000 miles to see. The wind was blowing with gale force."*

About half the men aboard the submarine were amateur photographers. All were topside, and they went into action to record the event on film. For this moment—8:30 a. m. on June 1, 1947—meant more to us than the end of a 17-hour night. *Sea Robin* had just become the first U. S. submarine to round the Horn.

As a matter of fact, she probably was the first underwater boat of any nation to do so. The few German U-boats that operated in Pacific waters in war years, and the few Jap submarines that appeared in the Atlantic, so far as is known, passed around Cape of Good Hope 21° 38′ farther north, on less adventurous voyages.

Gale Sends Crew Below

We were very fortunate to see the Cape so clearly. This southernmost point of the South American continent—a steep barren rock which rises 1,391 feet to a sharp summit—is cloaked in fog two days out of every three. Many voyagers around the Horn never see it.

But despite our good fortune, most of the volunteer cameramen had their fill of historical photography in a few moments. The cold gale sent them scurrying below to the four coffeepots which steamed constantly during this 55-day, 12,500-mile cruise of ours from Balboa, Canal Zone, to the Portsmouth, New Hampshire, Navy Yard. They learned the reason for the old warning, "Don't spit to wind'ard at Cape Horn" (page 141).

We had met with plenty of nasty weather on our way south, even though we were running with the storms, and a one-to-two knot current was with us. I have seen rougher weather over short periods of time in the Pacific, but here it was consistently bad.

As we lay to at the Horn and rolled with the strong swell, I recalled the heavy gales and dense fogs we had passed through in the last week. Almost subconsciously my mind turned to thoughts of those early Spanish, Portuguese, Dutch, and English navigators who had sailed these stormy seas more than three centuries ago on their way to the Far East. In their tiny sailing vessels they had gallantly headed into the teeth of those gales, sailing from east to west.

The Horn was discovered in 1616 by the Dutch explorer, Willem Schouten. It doesn't resemble a horn in any respect. He named it after his birthplace, Hoorn, in the Netherlands.

I also was thinking of the old Nantucket and New Bedford whalers and sealers who came this way early in the 19th century in ships not much bigger than Schouten's, and of the daring skippers of the racing Clippers in the China trade (page 140).

I acquired a new and healthier respect for their ability in navigating without charts and modern instruments.

Submarine Travel Preferred

Compared with theirs, my job was not so bad. To any spot in the world, and that includes Cape Horn, I would rather travel in a submarine than in any other vessel. A submarine rides a storm much better than any other ship.

It is true that bridge personnel take a beating in rough weather, but lookouts can be relieved frequently. The crew, snug and warm, rests comfortably below in heaviest weather, and if a storm becomes terrific, you can always dive down to calmer waters.

The only risk then is in surfacing before the storm abates, because a submarine always goes through a period of instability when it is surfacing.

As the sun rose higher and only the hardiest members of the crew remained above deck, we set out again, passing Cape Horn four miles abeam to port.

The crew was elated. Now, according to some unsupported legends of which I was unofficially advised, it would not be necessary for the men to fasten the top buttons of their coats. Those who wore chin straps, so the story went, had earned the privilege of wearing them tucked up over their caps. At least they had heard that such special distinctions were their due.

Torpedoman John Harrington proudly proclaimed himself the first American submariner to round the Horn, since he was farther forward in the ship than anyone else (page 142).

Our journey had a twofold purpose—to carry out a training program in cold and rough weather, and to promote good will in the South American ports we touched.

* See, in the National Geographic Magazine, by Alan J. Villiers, "Rounding the Horn in a Windjammer," February, 1931, "Cape Horn Grain-Ship Race," January, 1933; and "Inside Cape Horn," by Amos Burg, December, 1937.

Staff Photographer Willard R. Culver

Motor "Mack" Coss Paints a Cape Horn "Hash Mark" on Conning Tower Fairwater

Beside it, at right, are *Sea Robin's* campaign ribbons. At top is the multicolored American theater badge; center, Asiatic-Pacific, with three gold stars marking "successful" war patrols; and bottom, Philippine Liberation Ribbon (two small blue and white stripes in center on a red background) with a gold star showing combat.

Sea Robin is a Fleet Type submarine, 311 feet long, with a 26-foot beam. She carries a crew of seven officers and 78 enlisted men.

She was launched at Portsmouth Navy Yard on May 25, 1944, and when she was commissioned on August 7 of the same year, I became her commanding officer. She has never gone to sea without me since that day.

Sea Robin Veteran of Pacific

Sea Robin made three successful long-range patrols in the Pacific during the war. She sank a Jap ship one night in the Java Sea, and three more the next. In all, she sank 13 enemy ships and picked up 33 prisoners while ranging in the western Pacific, East and South China Seas, Yellow Sea, and Indian Ocean.

Once she crept along, submerged deep, for four hours, while Jap destroyers and subchasers dropped upon her all the depth charges they could muster.

She rescued two Army Mustang pilots down at sea, one off Hainan Island, the other south of Tokyo. She has made more than 1,100 dives and cruised over 100,000 miles.

Since the war, *Sea Robin* had been based at Balboa. I knew a training trip in rough waters was contemplated for her and requested the cruise around the Horn. To the joy of all hands aboard, the request was granted.

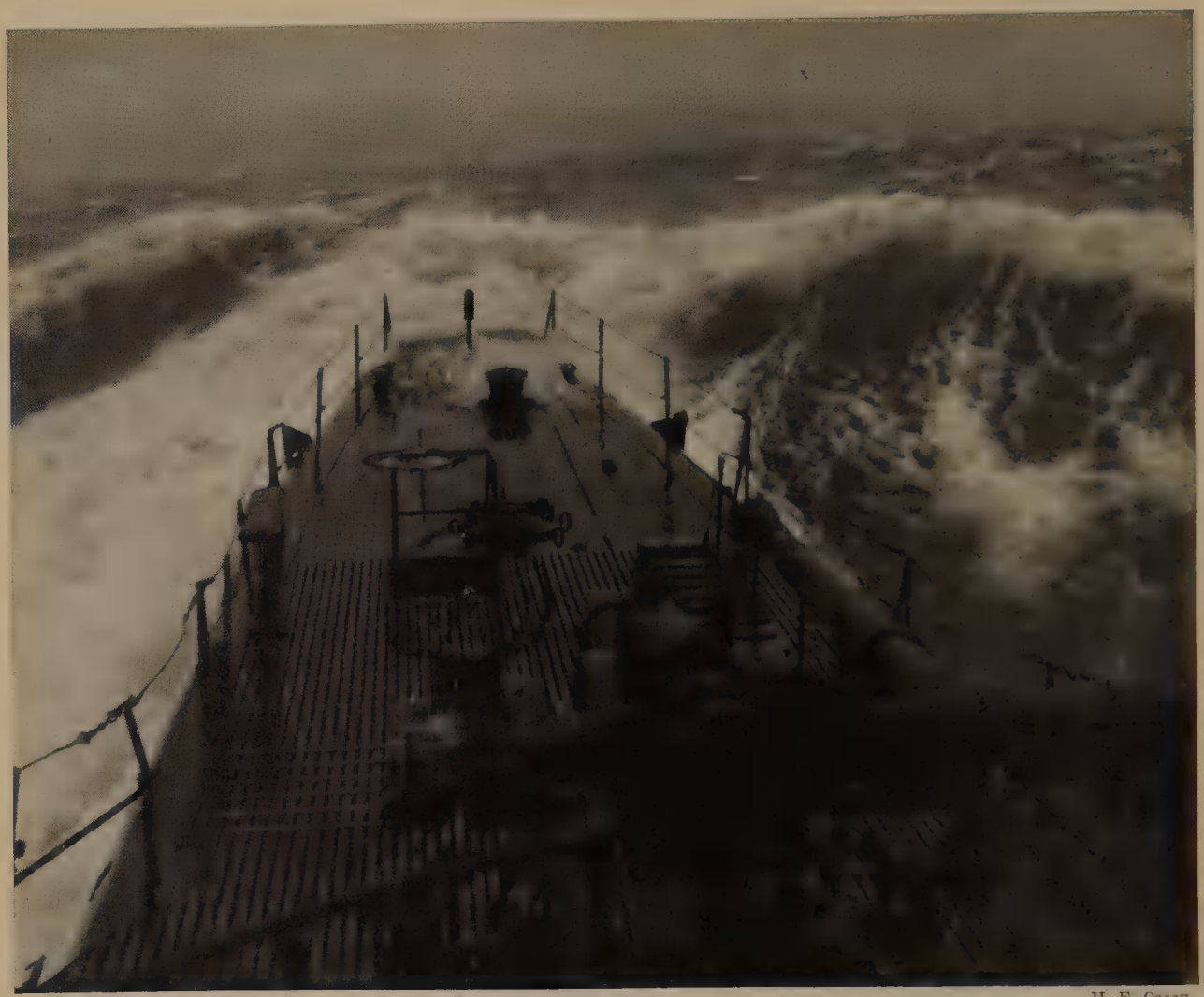
We left Balboa on May 15, with Lt. Comdr. E. E. Hopley as my executive officer. Thirteen of my men had been with me since *Sea Robin's* commissioning. Twenty-three, of whom twenty were brand-new men, were polliwogs—they had never crossed the Equator.

Also aboard were Patsy, my 18-month-old

From Paul C. Stimson

***Sea Robin's* Skipper Pays Tribute to Chile's Naval Heroes of Iquique**

Commander Stimson (right center) placed the wreath on the Navy Monument in Valparaíso. The shaft commemorates the deaths of Capt. Arturo Prat and his gallant crew when their corvette, *Esmeralda,* sank with colors flying in a naval battle in the War of the Pacific in 1879, when Chile fought Peru and Bolivia.



H. F. Casey

***Sea Robin* Bites into an Angry Sea as She Heads Southward Toward the Antarctic**

All too soon the rough weather test came to an end at 59° south, about 350 miles from the Antarctic Continent. Had storms become too severe, *Sea Robin* could have submerged to avoid rough seas and, at 60 feet below, found calm going.

English Springer Spaniel, who has made enough ocean trips to become a full-fledged sailor, and Lady, a small dog of doubtful lineage who was befriended by my Chief Motor Machinist Mate Hagopan in Key West, Florida.

Hagopan picked up the little mite there when she was so small she had to be fed from an eyedropper.

On May 17 we crossed the Line and got rid of the polliwogs in a rugged ceremony.

That formality out of the way, we began our academic schooling—courses in English, Spanish, mathematics, history, and mechanical subjects.

We also conducted work for the Navy Hydrographic Office, taking soundings by fathometer constantly, checking navigational aid information, and acquiring other chart data. Existing charts of both South Atlantic and Pacific coastal waters proved highly unreliable on many occasions.

Five days out from Balboa we encountered thousands upon thousands of water birds. We ran through them for several hours. One of the boys, mistaking them for ducks, shot one, then cleaned and cooked it. The cooked flesh tasted like extremely strong and somewhat overripe fish. Later we found out that it was probably a Peruvian cormorant.

Watch Lashed to Bridge

The weather became progressively worse as we proceeded southward. On May 22 we ran into a heavy storm. We took the lookouts below and lashed the quartermaster and officer of the deck to the bridge, to keep them from being swept overboard.

The twenty new crewmen, along with Patsy and Lady, were seasick. But we had a schedule to maintain, so we didn't bother to submerge, where the going would have been much easier, and *Sea Robin* rode out the storm in her usual gallant manner.

H. F. Casey

Chile's President and First Lady Bid Farewell to *Sea Robin* after a Cruise Undersea

Side boys stand by to render honors as the couple (at left) crosses the deck to board their launch. This is an unusual mark of respect on a submarine, reserved only for special guests. The President and Mrs. Videla had just completed a 10-mile trip in dense fog, during which the sub navigated by radar. Both enjoyed two dives made during the run.

On May 24 we anchored in Valparaíso, Chile.* A heavy swell swept the harbor, and before we could look about it was necessary to pass heavy stern lines over to the seawall to keep us steady.

Then we could pause to see the famous old harbor, surrounded by its shore-line business district, with pleasant suburbs looking down on both from the encircling hills.

Capt. Paul Weaver, at that time U. S. Naval Attaché, and Capt. Oberlin C. Laird, chief of the U. S. Naval Mission to Chile, were on hand to greet us. We called on the commander in chief of the Chilean Navy, Vice Admiral Emilio Daroch, and other Chilean officials.

There followed a round of royal welcoming. The Chilean Navy put an admiral's barge at my disposal, and *Sea Robin's* officers were entertained at one social function after another, in extremely hospitable style.

The enlisted men went on a sight-seeing jaunt to Santiago, Chile's capital, 116 miles away by rail, but the officers couldn't go—the program of entertainment in Valparaíso was too crowded to permit them to make the trip.

Climax of the first day's festivities was a dinner at the Presidential Palace, where both President Gabriel Gonzalez Videla and his youthful and attractive blond wife expressed a desire to take a dive in *Sea Robin*.

Chilean President Goes Aboard

I readily agreed. The next day a party of 14 Chileans, including Señor and Señora Gonzalez Videla, came aboard. We ran 10 miles out to sea in a dense fog to demonstrate navigation by radar. Both out and in, the President and his wife stood on the bridge, although it was very cold.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Twin Stars of Chile," by William Joseph Showalter, February, 1929; and "Capital and Chief Seaport of Chile," by W. Robert Moore, October, 1944.

British Combine

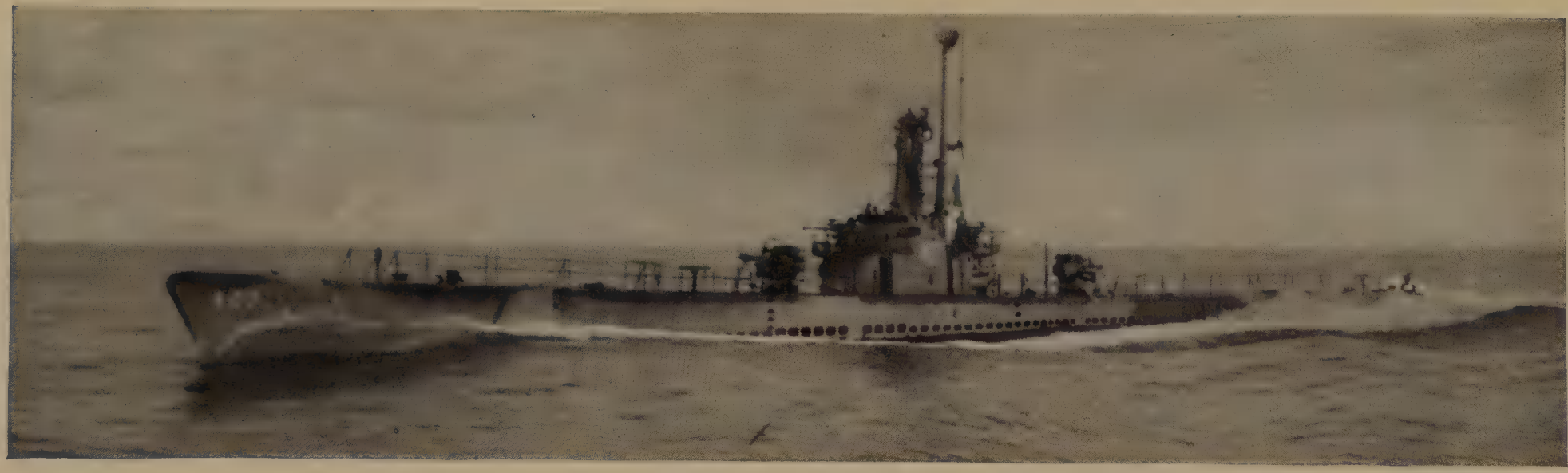
Sheep Raisers of the Falklands, off the Argentine Coast, Entertained U. S. Submariners with Dances and Penguin Hunts

Sea Robin put in to Port Stanley on her return from southern waters. The skipper tried to find a penguin for his small daughters, but fortunately for the bird he was unsuccessful. The girls had tentatively arranged with their grandmother in Danville, Virginia, to keep such a pet in the electric refrigerator (page 143).

From Paul C. Stimson

With Chile's President Aboard, *Sea Robin* Weighs Anchor for a Test Run out of Valparaíso

On deck, left to right, are Vice Adm. Emilio Daroch, Commander in Chief of the Chilean Navy; Comdr. Paul C. Stimson, skipper of the submarine; President Gonzalez Videla; Capt. Rafael Silva, his aide, and Capt. A. M. Zollars, U. S. Naval Mission to Chile. Mrs. Videla also accompanied her husband (page 133).



From Paul C. Stimson

***Sea Robin,* Veteran of Many Oceans, Shoves Off from Balboa, Canal Zone, for Her Cruise Around the Horn**

Only three years old, the submarine has roamed the North and South Atlantic, North and South Pacific, Indian Ocean, Java Sea, Banda Sea, South and East China Seas, and the Yellow Sea. During the war she sank 13 Japanese ships.

Staff Photographer Luis Marden

Wreckage of the *Graf Spee,* Nazi Battleship Scuttled in 1939, Stared Bleakly at *Sea Robin* as She Entered Montevideo Harbor

Three Lions

Up the Río de la Plata *Sea Robin* Pushed, to Dock at Montevideo's Water Front

Uruguay's capital fronts on a modern, $30,000,000 harbor. In background rises fort-crowned, 465-foot El Cerro, landmark for navigators. Before leaving, the submarine engaged in joint maneuvers with the Uruguayan *Maldonado,* a former United States P. C. boat (page 144).

Three Lions

In Valparaíso U. S. Submariners Tread Streets Familiar to Old Yankee Whalers

Once one of Spain's principal ports in the Pacific, Valparaíso was a haven for storm-battered North American merchantmen in the 19th century. *Sea Robin's* enlisted men, on shore leave, enjoyed a jaunt to Santiago, Chile's capital, 116 miles away.

"I Wish They'd Tell Me When They're Going to Dive"

John Montgomery, one of *Sea Robin's* bakers, takes a rueful glance at his "fallen" bread dough. When air pressure is built up in the ship just prior to a dive, to make sure all openings are closed, the rising batch falls flat as a pancake.

Staff Photographer Willard R. Culver

It's "Down the Hatch" for Patsy

H. F. Casey, Signalman Second Class, carries the ship's mascot, an English Springer Spaniel, below. Whenever *Sea Robin* submerged, Patsy took her stand in the control room. The rest of the time she stuck close to the cook.

Peabody Museum from Bettmann Archive

***Flying Cloud* Rounds the Horn on Her Record Voyage from New York to 'Frisco**

Sea Robin, on her Pacific-Atlantic passage, followed the stormy course ships took before the Panama Canal was built. *Flying Cloud,* 1,783-ton clipper, and the largest merchantman in her day, made her pace-setting run in 89 days and 21 hours in 1851. Built by Donald McKay, the famous clipper has been immortalized in painting and poetry. This illustration is from an old lithograph by J. and F. Tudgay.

We bundled both of them in submarine clothing, including face masks, and they seemed to enjoy it (pages 133 and 135).

Then we made two dives, and they liked them immensely. All of us got a real thrill out of entertaining our presidential guests.

Dominating Valparaíso harbor is the huge Navy Monument, surmounted by a statue of the Chilean hero, Capt. Arturo Prat, who lost his life when his antiquated corvette, *Esmeralda,* sank with colors flying in the Battle of Iquique, during the War of the Pacific in 1879. Here, in an impressive ceremony, I laid a wreath (page 131).

A School of Whales

Twenty-four hours out of Valparaíso we ran into a big school of whales. They were all around us.

They reminded me of an occurrence in the South Pacific on an earlier trip. *Sea Robin* was proceeding slowly when suddenly she struck something. The whole ship shuddered. I thought she had run aground. But immediately we discovered that a big whale had decided to surface and blow right in front of us—worse luck for it.

Sea Robin was not damaged, but the whale was—irreparably.

An angry whale once sank the whaling ship *Essex,* and on this event Herman Melville based his account in *Moby Dick.* But *Sea Robin* isn't to be treated with contempt by whales—she's too rugged.

At 40 degrees south we saw a school of what we took to be porpoises, except for the fact that they were snow-white with black dinner-jacket markings similar to penguins. There were about 15 of them, and they passed a quarter of a mile from us, heading north and swimming fast. They didn't turn and swim with the ship as porpoises usually do.

We had never seen this kind before and could not identify it. Upon our return to the United States we learned that these porpoises probably are a variety known by the formidable scientific name of *Lagenorhynchus cruciger,* and are cousins of the white-sided dolphin *(Lagenorhynchus acutus)* which roams the North Atlantic.*

As we sailed farther south the fog settled

* See, in the National Geographic Magazine, "Whales, Giants of the Sea," by Remington Kellogg, January, 1940.

From Rear Admiral A. Stanton Merrill, U.S.N.

Cape Horn Abeam! *Sea Robin* Reaches Her Goal, the Tip of South America

All hands braved a gale to scramble topside as the sun rose and the clouds obligingly lifted to give them a splendid view. But cold winds soon sent them below to four pots of steaming coffee (page 129). *Sea Robin* passed Cape Horn four miles off, and the history-making event was entered on the log. This picture, at much closer range, was made ten years ago by then Commander Merrill while he was a guest aboard a naval vessel, part of a Chilean squadron which sailed around the Horn on a 5,000-mile cruise.

down, and we could not take navigational sights for many days. We kept about 20 miles off shore. By May 30 we made landfall on Evangelistas Light, at the western end of the Strait of Magellan.

Heading into the Strait

We headed into the Strait during the night, with the wind blowing and the rain coming down in sheets. For 20 miles we worked our way inward, navigating with ease and confidence through the miracle of radar. Then, before dawn, we turned back, pulled clear of the Strait, passed Desolation Island at 5 a. m., and submerged in a smooth sea. We stayed below until noon and engaged in some tests.

We always had a slight difficulty with ship's baker when it came time to submerge, and this was no exception. He insisted on being notified personally, because the compression in the boat upon diving always could ruin any batch of bread dough he might be making.

The dough fell, he insisted, instead of rising, and he warned that if we didn't give him ample warning, we would all be eating hardtack! (Page 139.)

Patsy also had her eccentricities during submerging and surfacing operations. Whenever either began, she would make a beeline to the control room, no matter where she might be on the ship. It seemed as though she wanted to be in the best spot to observe the success of the operation. The rest of the time she never strayed far from the galley, having learned early where her meals came from (page 139).

When we surfaced this time, we encountered a gale blowing from the west, and soon experienced a storm worse than we had anticipated, even near the Cape. We lashed our watch to the bridge again. This time the storm lasted 48 hours, but *Sea Robin* rode it out pluckily.

When it abated we could see to the east the forbidding shore line, about 20 miles away, and beyond it the snow-capped hills of desolate Tierra del Fuego. Locations of scores of wrecks dotted the charts. We were about to draw abreast of Cape Horn.

After our view of the Cape we headed eastward for a few miles, then turned south. Even as we were departing, rain squalls began to close down on the Horn and in a few moments had enveloped it.

Staff Photographer Willard R. Culver

First Submariner Around the Horn? Yes—He Stood Farthest Forward!

John Harrington, TM2SS, "chocks off" June 1, the day *Sea Robin* reached the Cape. He was stationed here at that time, between the breech ends of the bow tubes (page 129). The gauges measure the pressure in the tubes, and sight glass on the breech door tells the amount of water in each.

We headed south because our plans called for a brief rough-weather test in sub-Antarctic waters. Watching for icebergs, we proceeded south all day and at midnight were at a point about 59 degrees south, some 350 miles from the Antarctic Continent (page 132).

It was a disappointment to me to turn north here. One more day on this course and we would have touched at Palmer Peninsula. But we had a schedule to keep and had to go back.

The Falklands, Britain's Farthest South

The next afternoon we reconnoitered Burdwood Bank, a poorly charted shoal a hundred-odd miles south of the Falkland Islands, and obtained data for the Navy Hydrographic Office.

The next day we submerged for brief tests south of the Falkland Islands and 24 hours later sailed into Port Stanley, where we were greeted by Commander Marshall, British naval officer in charge of the Falklands' chief port, and Mr. A. B. Mathews, Colonial Secretary.

We anchored in the harbor, for there were no docks with enough water for us. *Sea Robin* draws 17 feet (page 134).

We received a most cordial welcome. Local officers told us we were the first American warship to visit the islands in 50 years, and the first U. S. ship of any kind to call for 20 years.

The Falklands, southernmost colony of the British Empire since 1833, are a rocky group of islands lying more than 300 miles east of the Strait of Magellan. The principal islands are East and West Falkland.

Of the 2,400 inhabitants, nearly half live in Port Stanley. Nearly all of them are English, Scottish, or Irish. Their only important industry is sheep raising.

Acme

Unofficial Insignia Proclaim *Sea Robin's* Trail-blazing Run 'Round the Horn

Map and legend, "Cape Horn," were devised by the crew to mark the first journey of a U. S. submarine around the tip of South America. On right are the ship's campaign ribbons (page 130). Above the skipper, Comdr. Paul C. Stimson, is the ship's battle insignia, drawing of a sea robin. This fish walks along the bottom of the ocean, using pectoral fins for "feet." In the drawing, it clutches a torpedo in its walking fins!

Cold and bitter winds blow almost constantly. The thermometer, while we were there, ranged between 30 and 40 degrees. The only source of fuel is peat.

But the warmth of hospitality shown was in direct contrast to the weather. On both nights of our stay, dances were held for the crew. Our men got along famously with the Falkland girls. In the daytime the boys were entertained in the homes of the ranchers.

The officers enjoyed a hunting trip and a visit to a penguin rookery. My two very small daughters were anxious to have me bring them a penguin. They had asked their grandmother if it would be reasonable and possible to keep it in the Frigidaire! But the penguin nesting season had long since passed, and their rookeries were occupied by a few big hares.

In the harbor with us was a Diesel-propelled English whaler, whose men were after a load of geese for provisions to take farther southeast into the South Georgia region, a Falklands dependency, where they had their base.* Falkland Islanders receive a small bounty on every goose they kill, for the birds are unwelcome—they eat up the sheep pasturage!

From the Falklands we headed for Montevideo, capital and port of Uruguay. En route, cruising 250 feet below the surface, well out at sea, we hit a submerged pinnacle. A sounding taken a minute before had shown 13 fathoms below us.

An Obstruction Not on the Charts

Suddenly the *Sea Robin* jolted heavily. She was making between five and six knots. We came up a few fathoms without incident and everything seemed to be in good shape—we

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "South Georgia, an Outpost of the Antarctic," by Robert Cushman Murphy, April, 1922.

weren't taking any water. Some moments later we surfaced and examined the ship, but found no signs of damage. Of course there was no indication of any such obstruction on the charts.

On June 10 we sailed up the Río de la Plata, passing the wreckage of the German *Graf Spee,* trapped in Montevideo by British men-of-war in the sensational naval battle of December, 1939, and scuttled by its crew. The wreckage lies a few miles west of the channel (page 136).

Montevideo Now a Modern Port

Montevideo once had a shallow and exposed harbor, but before World War I it had been converted into a modern port through a huge program of dredging and breakwater building which cost more than $30,000,000.

Today it is one of the world's important ports, from which Uruguay sends many tons of meat every month to many parts of the world (page 137).

Capt. Forrest Tucker, U. S. Naval Attaché, and Uruguayan officials greeted us at Montevideo, and we entered upon a round of extremely cordial festivities.

On the second day, the *Sea Robin's* officers were the guests of the Inspector General of the Uruguayan Navy at a luncheon. Heretofore on public occasions, I had confined all my remarks, including responses to toasts, to English. But this time I ventured a little speech in Spanish.

When I was graduated from the Naval Academy at Annapolis eleven years ago, I was reasonably proficient in Spanish, but when I tried to brush up on it at the start of this trip, I found I was woefully rusty. So I obtained some of the ship's textbooks and studied all the way around the Horn.

Whether I acquitted myself well in Spanish at the luncheon, or whether my hosts were too polite to criticize me, I have not been able to decide. But it encouraged me to speak Spanish again later in a radio interview. If there were any complaints about this talk, the broadcasting people didn't tell me.

Uruguayan naval officers were particularly interested in *Sea Robin.* Because of her war record, we held open house for them. On the day of our departure we conducted joint exercises with R.O.U. *Maldonado,* a former United States P. C. boat.

I took 13 Uruguayan officers aboard *Sea Robin* for this event, and one of my officers was aboard the *Maldonado.* After the exercises the *Maldonado* acted as a courtesy escort, accompanying us at sea until dusk.

We enjoyed our stay in Montevideo. The conduct of the crew was exemplary. As a matter of fact, we had no unpleasant incidents anywhere we called. Incidentally, we took aboard at Montevideo 900 pounds of succulent tenderloin steak, which cost twenty cents a pound!

Leaving Montevideo, we resumed our hydrographic work and our training. We proceeded without incident until June 22. On that day we had submerged and were cruising very deep, when suddenly, without warning, some of the packing in the starboard stern tube blew out, and we took on some water. We surfaced, put the compartment under pressure, and repacked the tube.

A View of Devil's Island

Nearing French Guiana, we inspected Devil's Island from a distance of three and one half miles.

We were surprised to find that it rises to a height of about 100 feet and presents a pleasant tropical scene, without a swamp, and apparently mosquito and alligator free—not exactly what movie thrillers had led us to believe. But the mainland, which we had seen from about seven miles offshore, seemed all swampland.

We entered the Gulf of Paria—that body of water closed by Trinidad and the Venezuelan coast—by way of the Serpent's Mouth, and stopped at Port of Spain for a day. We left the Gulf by way of the Dragon's Mouths, pushed on through the Lesser Antilles, and called briefly at Bermuda.

By July 7 we had reached New London, Connecticut, where we were met by Rear Admiral James Fife, Jr., Commanding, Submarine Force, Atlantic Fleet. Then we headed for the Cape Cod Canal on the last leg of our voyage.

But apparently Massachusetts wanted to show us a thing or two about fogs herself. So dense a fog settled down that the Canal was closed to all traffic, delaying our arrival at Portsmouth by about six hours. The weather was warm, no gale was blowing, but that fog was almost as heavy and impenetrable as anything you will find around the Horn.

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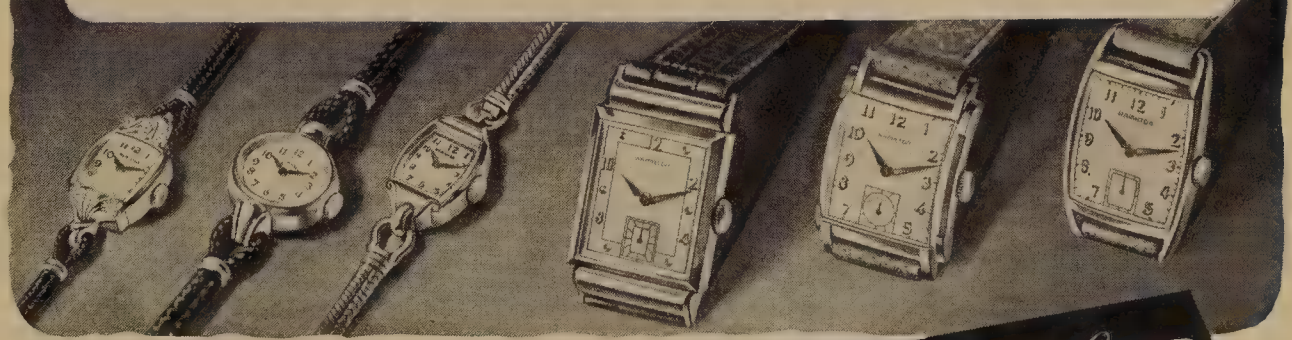

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(Below) A sky-blue gem, Wallowa Lake, lies below the snow-crowned Wallowa Mountains in Northwestern Oregon.

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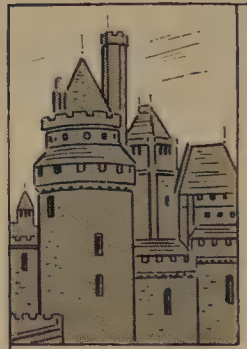

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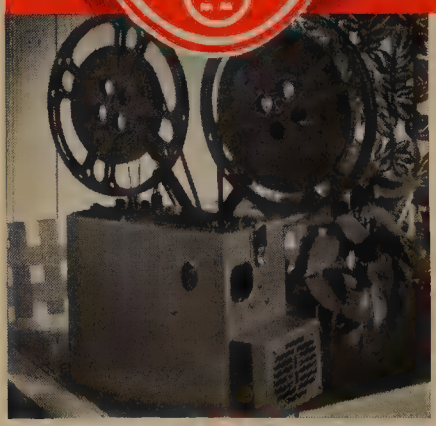

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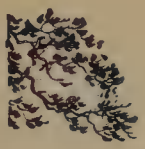

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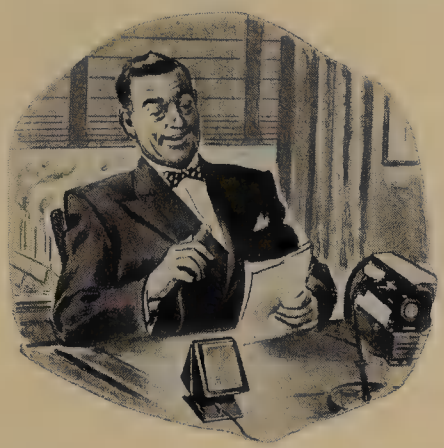

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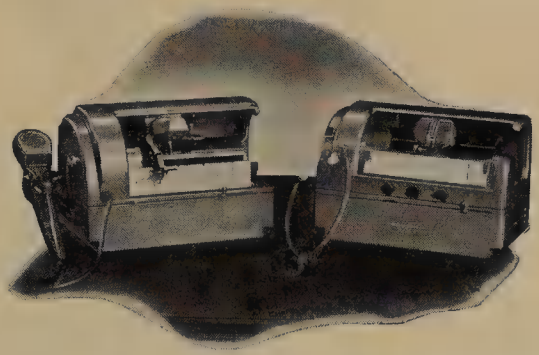

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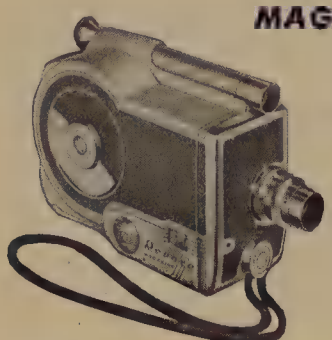

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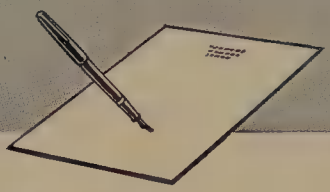

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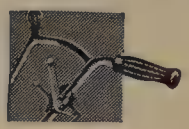

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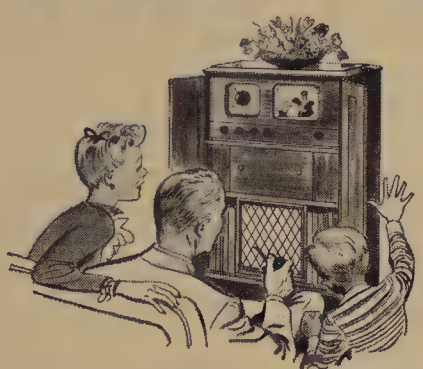

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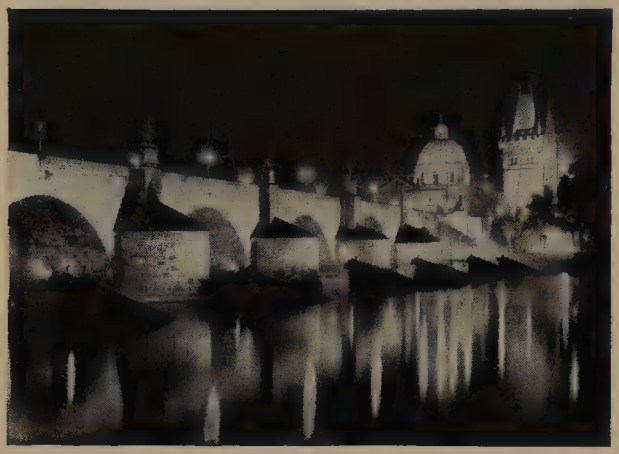

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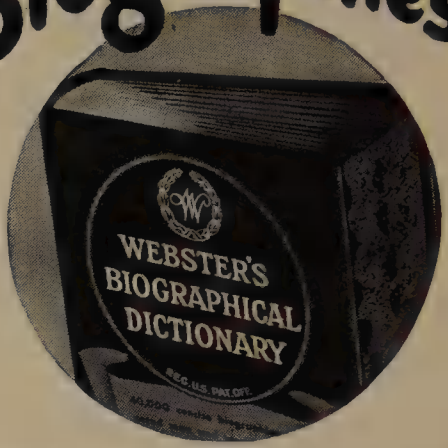

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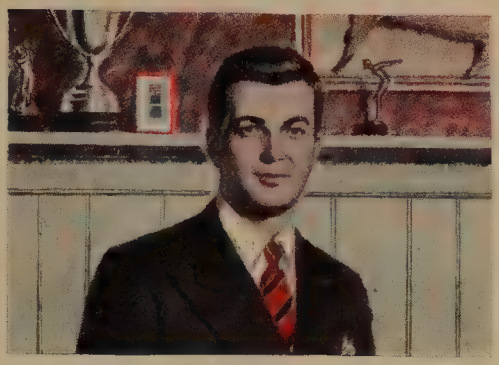

He has a normal heart

Your heart started beating before you were born, and in a normal day pumps about 11 tons of blood. When you are relaxed your heart works about one third of the time and rests two thirds. When you are active, or if you are overweight, it works harder and rests less.

That's why it's important for most people in the middle and later years of life to avoid excessive physical effort and to keep their weight down at least to normal. When you learn to "take it easy" you help your heart.

He abused his heart

Here was a successful businessman who repeatedly overexerted himself. By age 48 he had high blood pressure, and complained of occasional pains around the heart.

His doctor advised him, among other things, to get more rest and to cut down his week-end activities. But he continued to overexert himself.

At age 52, he suffered a heart attack. The extra strains upon his weakened heart had so damaged it that he became a "cardiac cripple." He had *not* helped his heart.

He helped his heart

This man, a doctor, had a heart attack at age 55. After recovering he returned to his practice, but cut down his working hours and the number of his patients.

He took time for a daily rest. He developed several hobbies which kept him happy and busy in leisure hours but did not put a strain on his heart. At 65 he retired completely from his practice. By thus helping his heart—by knowing how to live within its limitations—he was able to enjoy many useful years of life after retirement.

Start helping your heart early

While there is much less heart trouble in youth and early middle age than there used to be, more and more people are now living to reach the later years when there is a higher death rate from heart ailments.

By learning as you grow older to stop before you're overtired, by knowing how to relax, by having periodic medical examinations, and by following your doctor's advice—you can help avoid heart trouble, or lessen the effect if it should strike. Medical science has developed potent drugs and skilled techniques to help keep you and your heart healthy.

Research on diseases of the heart is increasing. To aid in this work, 151 Life Insurance Companies support the Life Insurance Medical Research Fund which makes grants for special studies in heart disease.

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TO VETERANS—IF YOU HAVE NATIONAL SERVICE LIFE INSURANCE—KEEP IT!

Chinese trouble jar

IN THE third month of every year many primitive tribes of China observe a rite supposed to keep their villages free of misfortune.

Into a large jar, they toss bits of stone and scraps of metal. These represent *all* the misfortunes that have plagued the village for the past year.

On top of the scraps the Chinese put gunpowder. And after burying it in the ground, they lay a powder train to the jar and light it.

When the powder-filled jar goes up with a bang, the Chinese figure that they've helped to ward off their misfortunes for another whole year.

Now, it would be a handy thing if you could simply light a match and blast all misfortunes—such as accidents, fires, and burglaries—from your path for the rest of 1948. But such a gesture wouldn't work for you, we suspect, any better than it does for the Chinese.

You *can* make sure, though, that practically no misfortunes will cause your family financial harm and needless worry. You can invest in insurance, which you need today *more* than ever.

These days accidents are happening at the rate of one every three seconds. Do you have enough accident insurance to take care of your medical expenses and your family's living costs, should an accident lay you up?

Your house and its contents would cost a lot more today than you paid for them. Are they *fully* covered by fire and burglary insurance?

Living costs are up. Do you have enough life insurance to keep your family from want should they be deprived of your earnings?

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VOL. XCIII, No. 2 WASHINGTON FEBRUARY, 1948

THE NATIONAL GEOGRAPHIC MAGAZINE

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Haunting Heart of the Everglades

By Andrew H. Brown

BIG BRAKES on four war-surplus bomber tires ground our 'Glades buggy to a sliding stop.

"There they go—into the high grass!"

I jumped down from my seat, climbed to the snake box in the back of George Espenlaub's swamp chariot, and stepped up to the cab roof. Two buck deer had sprung from the trackless Everglades ten yards ahead. They dropped out of sight in a swale.

"I'll beat the marsh and try to flush them," George proposed. "Maybe they'll run out past the buggy."

My companion pushed through head-high saw grass, flailing the thick growth with a stick. Suddenly the graceful animals bounced up almost from George's feet. They fled across the prairie, two tawny blurs with bobbing white "taillights."

The bounding deer gave the crowning touch of life to flat, rippling grasslands. Dips in the plain cupped mirrors of rain water floating white water lilies and edged with wild iris. Cloud castles billowed in a hot blue sky.

Wild Land of Swamp and Cypress

Our vantage point was deep in the wild heart of south Florida's Everglades, that alluring expanse of swamp and savanna, cypress head and hammock jungle, which Miamians jestingly style their city's 4½-million-acre backyard.

Technically, the Everglades are a broad sweep of saw-grass plains curving around the southeast side of vast Lake Okeechobee and extending south to Florida Bay and the Gulf of Mexico.

By freer interpretation the name "Everglades" takes in Big Cypress Swamp and Okaloacoochee Slough and hence most of Florida south of Lake Okeechobee.

During late winter and early spring of 1947 Willard Culver, National Geographic photographer, and I wandered foot-loose in this greater area.

Natural conditions long hampered development of the Everglades. Today, onetime "impediments" are being turned to man's benefit.

Water control has opened thousands of acres of black earth to truck crops. Sugar cane thrives on the peaty nitrogenous soil. Drier flatlands have been cleared for pasture. Remote sloughs are yielding hidden riches of pine and cypress timber.

Big stretches of the country devoid of economic value are being set aside for water and wildlife conservation—and for recreation.

The Nation has recently received a magnificent "gift," Everglades National Park, which President Truman dedicated on December 6, 1947. Twenty-eighth such public reserve, it is the only subtropical national park in the United States. A new three-cent stamp has been issued to celebrate the event.

Justified at last were the vision, faith, and unrelenting efforts of 81-year-old Ernest F. Coe, Director of the Everglades National Park Association. For 20 years Coe fought, often single-handed, for creation of a national park in south Florida's unique wilderness.

The Everglades National Park Commission also was instrumental in making the park a reality.

Limits of the park eventually are expected to embrace most of Florida Bay, including nesting keys of the striking, but scarce, roseate spoonbill (Plate IV). The park's preliminary 710-square-mile area takes in a broad patch of the tip of Florida south of the Tamiami Trail (map, page 149).

About half the protected region is marshy grasslands and the rest mangrove swamps

Ernest Bennett from Miami Daily News

To Picture an Air Plant, the National Geographic Photographer Shinnied up a Cypress

Willard Culver reaches for the camera passed up to him by the author, Andrew H. Brown. The bushy epiphyte, left, is one of thousands that bedeck trees in the western Everglades (Plate V).

veined by blue tracery of lakes, rivers, and tidal channels.

We struck out for the park area from Homestead, swaying down the narrow road towards Cape Sable, ultima Thule of mainland Florida.

Roads and Canals Are "Siamese Twins"

In the Everglades, road and parallel canal are inseparable. To build a highway in this soggy land you dig a ditch (which fills with water as fast as you shovel it out) and throw up the excavated rock (limestone lies everywhere just below the surface) in an embankment to form the new roadbed.

A clear, cold sunrise found us outward bound from Coot Bay on the Fish and Wildlife Service patrol boat, *Osprey*. We were off on a 100-mile cruise to Shark River. (Before the park took over, this section was part of the Everglades National Wildlife Refuge.)

At the launch's helm stood big, weatherbeaten Warden Barney Parker. He cants a ranger's felt on the back of his head, rests a generous paunch against the wheel, handles a revolver like one of the James brothers, and has a heart soft as a June sunrise.

Even Barney has been lost in the maze of winding creeks that patterns this area.

Far up Shark River, where the tranquil stream splits into two reedy branches, we hove to off the Little Banana Patch, a favorite camping spot for a century. Here Daniel B. Beard, then Refuge Superintendent, now Superintendent of the Everglades National Park, and Walter Weber, wildlife painter, set up a base camp to use while Walt sketched birds in their native habitat.*

A few banana trees, planted long ago by Indians, name the place. Under a vine-hung Ficus tree was a flat site for a tent (Plate I). Giant ferns gave Weber and Beard a soft foundation for the floorcloth.

Leaving Weber and Beard to feather their new nest, Barney, Culver, and I whisked upstream in the outboard dinghy. A big alligator slid off a mud bank (page 172). The winding creek unveiled an amazing abundance of birds.

* Walter Weber's paintings of wildlife of southern Florida, with descriptive text, will appear in a subsequent issue of the National Geographic Magazine.

Staff Photographer Willard R. Culver

Through Headphones He "Hears" How Much Water Flows Past

His boat held in place by a cable, a hydraulic engineer of the U. S. Geological Survey counts clicks caused electrically as the current of Miami Canal turns the rotor suspended from the boom (left). By taking readings at varying depths and at several stations across the stream, the technician computes the volume of fresh water passing this point. Geologists recommend keeping selected areas of the Everglades wet, by use of control dams on drainage canals, to help maintain a high water table along Florida's populous Atlantic coast.

Flushed by the whine of our motor, clouds of hundreds of snowy egrets, white ibis, little blue herons, and Louisiana herons rose from trees along the stream. They flew upriver ahead of us, alighted again, only to flap away when we buzzed around the bend (page 171).

Lesser numbers of ducks, wood ibis, white pelicans, black-crowned night herons, cormorants, anhingas, skimmers, kingfishers, and grebes added to the rich variety of this ornithological field day.

Indian Villages Flank Tamiami Trail

Returning to Miami, we drove west across the waist of the Everglades.

Our highway was the famed Tamiami Trail, the name a contraction of Tampa and Miami, terminal cities of the 270-mile-long nature-way (page 150).

Apart from the road, planted Australian pines, and canal there were few signs of man's intrusion. We visited Seminole Indian villages which stand opposite the infrequent filling stations (Plate III).

Colorful natives, descended from survivors of the Seminole War of bitter memory, lived much in the manner of their more aloof cousins back in the bush.

Facing the highway were counters laden with cypress boat models, with multihued aprons, capes, and skirts, with dolls fashioned in their makers' image.

Just east of the boundary between Dade and Collier Counties saw-grass prairie merged

Staff Photographer Willard R. Culver

A Mechanical "Mole" Digs a Pipeless Conduit to Drain and Water Fields

A tractor pulls this caterpillar-tread device across vegetable fields near Lake Okeechobee. The worker lowers the thin vertical blade, at the bottom of which is a torpedolike cylinder closed at the forward end. As the caterpillar clanks along, the blade cuts the soft muck as a knife slices cheese, and the cylinder burrows through the ground two to three feet below the surface. In its wake it leaves a tunnel of the same diameter as the "mole." Soil here is so adhesive that the excavated tube does not collapse and may last for years. Spaced at intervals across a field, these subterranean channels drain farm lands that are too wet, and irrigate the soil from canals when drought prevails.

into open woods of scrub cypress and scattered palms, like parkland. Then the road plunged into real forest, mostly cypress, but with more and more palm and pine as we rolled west (page 146).

We came to the remote and shady town of Everglades (population 518), seat of Collier County, just as a fleet of brightly trimmed sponge boats chugged up the sweeping curves of Barron River (Plate XVI).

It was a warm sunny evening with a skyful of fluffy clouds. I watched the return of weary but triumphant anglers, guests of the famous Rod and Gun Club, sport fishing center for the Ten Thousand Islands region.

A gleaming tarpon tipped the scales at 40 pounds. Snook, redfish, red snapper, amberjack, and other kinds lay on the sea wall.

County Named for Car-Card Booster

Collier County, established in 1923, takes its name from Barron Collier of streetcar-card advertising fame, who bought up tens of thousands of acres of southwest Florida in the

Drawn by Theodora Price

A New National Park Protects a Wild Stretch of the Everglades; Adjacent Lands, Unreclaimed Swamp a Generation Ago, Yield Lumber, Crops, and Cattle

Everglades National Park is 710 square miles of marshy prairies, mangrove thickets, and cypress swamps fringed on the seaward margins with tidal rivers, lakes, and bays. It is the only subtropical national park in the United States. The recently dedicated reserve will afford refuge for nesting colonies of egrets, ibises, herons, and other birds decimated in the past by ruthless hunting. Visitors also may see deer, alligators, snakes, bobcats, and turtles. The region features strange and beautiful trees and flowers, including air plants and wild orchids (Plates V and VIII, and page 146).

early twenties. The Barron Collier Interests helped complete the Tamiami Trail and planned a second Miami Beach on Marco Island, a project still in blueprint stage.

The Collier Interests' land holdings of one-and-a-quarter *million* acres (an area the size of Delaware) include 60 percent of Collier County and overlap into adjacent Lee and Hendry Counties.

D. Graham Copeland, recently retired resident manager of the Collier Interests, listed the sources of Collier County's income in order of importance: wood products (mostly pine and cypress lumber), early truck crops, commercial fishing, cattle ranching, and tourist trade. Only producing oil wells in Florida are at Sunniland in the north of the county.

Collier County was the scene of last engagements of the Seminole War. To document early events, Copeland has assembled a six-foot pile of reminiscences, statements, newspaper clippings, and letters. I was allowed to look through this absorbing material.

Staff Photographer Willard R. Culver

Telephone Poles, Road, and Canal Seem to Merge in the Flat Distance of the Everglades

From Miami on the Atlantic coast to Naples on the Gulf of Mexico there are no sharp turns and only a few tiny hamlets to slow down traffic speeding across the Tamiami Trail. The highway (named by contraction of Tampa and Miami, its terminal cities) was completed in 1928 at a cost of $8,700,000.

Andrew H. Brown

Grass Higher than a Man's Head, Stretching to Horizons of the 'Glades, Ripples Like Wheat in the Wind

Among the region's memorable characters was Juan (Old John) Gómez, claimed by many to have been a pirate with Gasparilla. When he died early in the 1900's, estimates of his age varied from 115 to 137 years!

Born a Roman Catholic, he became a Methodist at the age of 110 or 115. The local minister was so impressed that he designated every fifth Sunday of months that had five Sundays "Gómez Sunday." On those days Methodists of the vicinity piled into boats and went out to worship at Gómez's home on Panther Key.

An article in the *American Eagle* of Estero, Florida, published on January 20, 1927, added these details: "He (Juan Gómez) had heavy calluses on his feet and could run across an oyster bed as comfortably as on a hardwood floor. He was uneducated but spoke seven languages. . . . He declared when his age was discussed, 'God has forgotten me; it is past my time to die.' "

Reckless Harvest of Birds and Gators

"Wildlife was incredibly abundant hereabouts last century and even in the early part of this one," Copeland attested.

"Early settlers told me of shooting enough plume birds in one day to furnish aigrettes worth $500, then in demand to decorate women's hats. Plume hunting was prohibited by law in 1891, but there was no attempt at enforcement for years after that. I heard of hunters slaughtering 77 deer in one drive, and 135 alligators in a single mudhole."

Some men only pulled the gators' teeth. For these ivory fangs, used for watch fobs, earrings, charms, bracelets, and other gewgaws, the reptile dentists got from $1 to $5 a pound.

Mr. R. B. Storter of Naples told me: "I carried over 10,000 alligator hides to Tampa in February, March, and April of 1898. They were shipped to Boyer Brothers in New York. About 1,000 of the skins were taken from Roberts Lake alone—one of the most fabulous gator 'mines' in the country.

"That was an unusually dry year, and the big creatures collected in places where water could be found. Crowded in small areas, they were easy victims of hunters."

Egret shooters would search for rookeries. When they found one, they ruthlessly wiped it out—destroying up to 15,000 birds.

On near-by Chokoloskee Island, C. S. (Ted) Smallwood, island patriarch, led me cheerfully up and down dim aisles of his big store. It stands on pilings above the tide wash. Counters and shelves bulged and overflowed with masses of jumbled merchandise in a picture of country-store abundance the like of which I had never seen. He cut me a generous slab from a huge wheel of yellow cheese.

"I've turned over the shop to my children," he said, introducing two daughters, a son, a son-in-law, and two grandchildren.

Smallwood, whose keen blue eyes give the lie to his 74 years of age, led me over the heart of the strange island. Little sand and shell-mound hills framed the steepest landscape I had yet seen in south Florida.

"Once I had a lot of good fruit trees." My guide turned back the years. "Most of them have gone to seed."

Like a friendly old pirate, Smallwood favored one leg as he climbed firmly up and down the hillocks, showing off scattered wind-tortured guavas, avocados, olives, papayas. Shade trees were native gumbo-limbos, palms, and Australian pines he planted long ago.

I met 90-year-old Susan McKinney, whose late husband, C. G. McKinney, opened the first general store on Chokoloskee Island in 1886. A sound, if firmly negative, business policy used to be emblazoned on his billhead: "No Banking, No Mortgaging, No Insurance, No Borrowing, No Loaning. I must have cash to buy more hash."

North from the Tamiami Trail, the Immokalee road, State Route 29, bisects Big Cypress Swamp, then straightens and arrows through range land to meet the Fort Myers-West Palm Beach road.

Big Cypress Going Fast

East of Route 29, lumbering is gobbling up big chunks of mixed pine and cypress forests. West of the highway, in the almost impenetrable Fakahatchee Slough, a long strip of virgin cypress is the largest remaining single stand in the United States.

A black plume of smoke from a tall stack guided us to the Copeland camp of the Lee Tidewater Cypress Company, which owns most of this magnificent forest.

J. R. Terrill, logging superintendent, showed us the operation.

We saw one of the semiweekly 40-car trains puff out of the yard, hauling away 400,000 board feet of huge rusty-hued logs to the sawmill at Perry in north Florida. Weather-resistant cypress is in demand for siding, shingles, and wood trim as well as for paneling and other interior finishing.

Terrill piled us on a gasoline speeder and we rattled up the line into the woods. Gray stumps dotted a logged-over area, where thick vines trailed on the ground.

"The fallers claim the vines are so tough," Terrill said with a smile, "that if one clings

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Ektachrome by Willard R. Culver

A Famed Wildlife Painter Studies Wing Detail of an Egret, Once Hunted for Its Plumes

Walter Weber inspects an American egret picked up dead from Shark River, deep in Florida's Everglades. The artist made sketches for bird and animal paintings especially for the NATIONAL GEOGRAPHIC MAGAZINE.

© National Geographic Society

Ektachrome by Willard R. Culver

A Power Derrick Plays a Giant Game of "Pick-up-Sticks." Flatcars Roll Huge Cypress Logs Out of Fakahatchee Slough

The Lee Tidewater Cypress Company ships the big russet boles of weather-resistant wood to its sawmill at Perry, Florida.

Car and Passengers "Refuel" Together in Mid-Everglades. Beyond the Tamiami Trail Seminole Indians Welcome Travelers to Their Village

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Ektachrome by Willard R. Culver

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IV

Kodachrome by Willard R. Culver

Showy Roseate Spoonbills, the Adult White and Pink with Carmine Patches, Crown a Mangrove with a Living Frieze

Using a Smoker, Barehanded Keepers Dope Bees

Drugged by the fumes, Collier County bees are easily shifted about on the frames. Everglades hives yield thousands of pounds of honey every year.

© National Geographic Society

Red-spiked Air Plants Are Miniature "Hanging Gardens"

The striking bromeliads favor rough-barked trees, but also grow on stumps and fence posts. They draw sustenance from the air.

Kodachromes by Willard R. Culver

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Kodachrome by Andrew H. Brown

Flames Race and Crackle Through Sugar Cane to Burn Off Excess Leafage Just Before Stalks Are Harvested

Firing the cane saves much labor in cutting and does slight damage. In these fields of the United States Sugar Corporation, in the "sugar bowl" area around Clewiston, sugar cane planting is staggered so harvesting continues for seven months.

Steel Claws Dump Bunches of Cane into Tractor Wagons. Rail Cars Will Carry It the Last Lap to the Sugar Mill

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A Gumbo-limbo Tree Writhes Skyward from Shell Mounds Where a Digger Probes for Relics

Archeologists have uncovered important artifacts of early Indian dwellers from shell beds on Marco Island. Mysterious piles, some 30 feet high, apparently were discards from aboriginal shore dinners.

Sledlike Craft Push Air to Speed Through Water Only Inches Deep

Appropriate to the sky-and-water landscape of Hillsboro Marsh are ingenious air boats. Old auto engines turning airplane propellers drive the flat-bottomed boats. Screening prevents injury from whirling blades.

© National Geographic Society

Kodachromes by Willard R. Culver

An Air Boat Roars Faster over Grassy Shallows than Across Open Water

Grass and reeds, leveled by its passage, provide a slippery "runway" and reduce water drag. Skimming over such shoals the craft may speed at 50 miles an hour. Big rudder, deflecting the slipstream, is plywood.

Ektachrome by Willard R. Culver

Sonny Turns the Sewing Machine to Help Mama Make a Skirt

Daughter fits a doll with a hair-do just like mother's. The family sits cross-legged on the table in their cool, thatched *chickee*. Rainbow-hued handicrafts tempt motorists along the Tamiami Trail.

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Proud of His Fine Saddle, a Seminole Cowboy Relaxes During a Lunchtime Break

"Ten Little, Nine Little, Eight Little Indians" Find School Can Be Fun

One young lady watches to see that teacher sticks to the lesson! W. D. Boehmer, Government instructor at Brighton Reservation, teaches a first grade group. Girls wear native costume or modern dress, as they please.

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Ektachromes by Willard R. Culver

Earnest Young Day Pupils Go Home at Night to Forebears' Age-old Way of Life

© National Geographic Society

XII

Kodachrome by Willard R. Culver

Straight-backed Seminole Women Prepare the Evening's Food with Dignity and Grace

In fastnesses of Big Cypress Swamp thatched family *chickees* cluster on cleared, drained land. Close by looms the wild, wet forest. Pots, pans, and sacks of white potatoes come from stores in the distant town, but bananas, pork, chicken, yams, lima beans, and sugar cane are grown in the village.

Stolid Face Softens as a Junior Tribesman Soaks Up Lunch

Jimmie Boy, motherless soon after birth, basks in gentle care of his aunt.

© National Geographic Society

Charlie Cypress Works the Skill of Ages into a Bow

Like other Seminole elders, he clings to old-time tunic (under the sweater).

Kodachromes by Willard R. Culver

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XIV

Kodachrome by Willard R. Culver

Everglades Cattle "Were Lapping Blackstrap Molasses with All the Gusto of Pickaninnies Ear-deep in Watermelon"

The author thus reports the zest of beef cattle for a molasses-enriched diet on the United States Sugar Corporation's Sugarland Ranch near Clewiston. Steers grow fat on the novel ration. The company has developed four purebred herds on choice pasturage reclaimed from marsh.

A Wildlife Refuge Superintendent Sculls Photographer Culver Close to Tangled Mangroves along Shark River

Daniel B. Beard guided THE GEOGRAPHIC's field men through the maze of channels in Whitewater Bay and Shark River areas. Mangroves in almost impenetrable ranks hedge the streams, thrusting arching, stiltlike roots into the salty or brackish waters. Near the river's mouth groves of giant mangroves reach a height of 80 feet.

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Kodachrome by Andrew H. Brown

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Fresh-caught Prizes Festoon the Gay Sponge Fleet, Moored in Barron River

Fleeing a storm in the Gulf of Mexico, the colorful vessels found shelter in the flowing "Main Street" of the town of Everglades. Manned by Greek-Americans, almost all the boats were out of Tarpon Springs, Florida sponging center.

to a log it'll stretch from woods to camp without breaking!"

We reached the cutting area. A high line run from a skidder was snaking fat trees out of jungle so thick we could see only a few yards into it. Native royal palms lifted 100-foot-tall green crowns (Plate II).

"It would give a rattlesnake a headache to try to run in that bush," the speeder driver commented.

We watched a team of fallers topple a big cypress with a double-handled saw. With a sound like close thunder the soaring giant crashed through lower growth to smite the ground with a booming thud.

"That one is between 500 and 750 years old," stated Terrill. "Not a very old one. It's surprising how sound and healthy they are, after standing up to their knees in water all their lives—and without their rubbers!"

As we rode out of the swamp, Culver asked, "Isn't it hot and miserable in the woods in summer?"

"Well, the heat's bad, but the bugs are awful," Terrill replied. "One man's whole job is just to sweep flies off the backs of the men operatin' the levers on the high line.

"Horseflies get so thick in late April, if you're settin' on a screened porch, you can't see a person walkin' by in the street. Why, I know a man whose chicken run was beside a street light. Horseflies and other bugs flew into that light at night and fell so thick, he didn't have t' feed his hens for two-three weeks!"

Reservations Are Indians' "Kingdoms"

That evening we drove northwest to Fort Myers where we looked up Kenneth A. Marmon, Superintendent of the Seminole Indian Agency.*

Marmon offered to show us the two major Seminole Indian reservations in south Florida: Brighton, northwest of Lake Okeechobee, and Big Cypress, 30 miles south of the Lake. On the latter reserve 90 to 120 Indians live on 42,663 acres—or 356 acres, minimum, per Indian!

These lands are the Indians' exclusive hunting and cattle grazing domain.

Of the 700 Seminoles in south Florida, only 42 are mixed bloods. About 15 or 20 percent understand English. Some won't talk the white man's language, but they understand it well enough.

Receiving no dole, proud aborigines must work for their living. Many, therefore, have left the reserves to get jobs ranging from wrestling alligators in Miami animal exhibits to cutting sugar cane, and picking tomatoes, beans, and fruit crops. Others work on ranches or in lumber mills, drive trucks, or sell handicrafts along the highways.

In 1936 Florida's Governor David Sholtz and his cabinet met an assemblage of 273 Seminoles and asked them what they would like from the white man.

After a brief huddle, the native spokesman answered succinctly, "Just let us alone!"

"We have high hopes for cattle raising on the reservations," Marmon told us. "We've undertaken the range program to improve the Indians' lot.

"The Seminoles face a dilemma," Marmon explained. "Instinct and custom make them cling to the traditions of their ancestors, while civilization knocks at their door, urging them to join the big parade of progress."

Wednesday, March 5, was dipping day for cattle on Brighton Reservation. Marmon drove us out to see 2,000 Hereford cattle run through the tick-killing bath.

Crisp Beef Spareribs—Delicious!

Lunch break was half over when we drove up to the camp. Great fire-crisped hunks of fresh beef spareribs were proffered us by Fred Montsdeoca, white extension agent who supervises all cattle operations. Live-oak firewood imparted spicy flavor to the meat.

Plump, cheerful Seminole women, clad in their usual modest, rainbow-colored capes and vast skirts, brought us hot biscuits and black coffee. A coonskin stretched on palmetto ribs hung on a near-by tree. Tripe from the steer whose flesh had fed us was drying in the sun. Lunch out of the way, the women got busy on bead bracelets and dolls' clothing.

"At present we have a tribal herd," Montsdeoca said. "Everybody has an equal interest in it. Our aim is to build up the herd to a level that'll allow us to deal out a number of animals—say 20 head—to individual Indians."

We met Charlie Micco, Frank Shore, John Josh, and John Henry Gopher, Seminole trustees of the cattle enterprise. They were appointed by the tribe and approved by the Commissioner of Indian Affairs.

"Indians make fine cowboys," Montsdeoca commented. "They take naturally to horseback and are fearless riders."

We watched the slim, wiry men rounding up the cattle. They wore checked shirts, broad-brimmed hats of felt or straw, boots and spurs, dungarees and neckerchiefs, like any Western cowpoke (Plate X).

Sunset silhouetted islands of cabbage palms

* See, in the National Geographic Magazine: "Indians of the Southeastern United States," by Matthew W. Stirling, January, 1946.

Homer Rhode, Jr.

When Rains Flood the 'Glades, a Deer Needs Wings or Fins

Thrashing through the deep water, this exhausted yearling deer was found up to his neck in trouble 35 miles north of the Tamiami Trail. After torrential downpours, such as drowned out vast stretches of the Everglades in the fall of 1947, deer may easily be captured alive.

scattered over the green land. The Indians packed their women into a truck and followed them home, sitting their horses with the loose-limbed, straight-backed grace of men grown to the saddle.

Another day Marmon led us 30 miles south of Lake Okeechobee through Okaloacoochee Slough to the second Seminole reservation in the Big Cypress Swamp.

The primitive road grade was washed out, so we plunged across the open countryside, navigating by tree clumps and larger ponds and sloughs.

What a ride!

A young Seminole buck, Willie Tommie, drove us over a trail half-submerged by recent rains. Willie got us there and back, proving as trailwise as his pathfinding forebears.

Far from towns or traffic the pattern of life was primitive but peaceful. An Indian mother beat dirt from her family's clothing on the shore of a pond. Another woman pounded corn to meal with a cypress pestle in a mortar cut from a live oak log. Everyone went barefoot, from beady-eyed toddler to most ancient tribal patriarch. Pigs and friendly brown dogs roamed at will around the cook table (Plate XII).

Between La Belle and Lake Okeechobee we were wizarded from the Florida of palm and pine, cypress swamp and saw-grass marsh, to what looked like rangeland of eastern Wyoming. Cattle by the thousand, many of them pearl-gray Brahmans, grazed on flat land that had been cleared almost to the last palmetto patch.

Brahmans, introduced from India, are remarkably tolerant of heat and resistant to ticks and mosquitoes.

Horsemen cantered across the distance to tie up at weather-beaten cattle camps. At a modest ranch house we stopped for a visit with one of the leading Everglades cattle men. On 80,000 acres (there is nothing small about *this* country!), Joe B. Hendry runs about 8,000 head of cattle.

Homer Rhode, Jr.

An American Egret (Right) Deftly Flips a Small Fish into Position for Swallowing

The bird at left, a snowy egret, seems to sulk because his larger angling mate has all the luck. The fishing hole is an Everglades canal.

With vast cattle ranges, early truck crops, and sugar cane the Everglades are discrediting early prophets of gloom who called the region useless. The future is evoked with caution, however, for in many sections thin soils, fire damage, and vexing water control problems put a checkrein on landlords' rosy dreams.

Land Suffered from Overdrainage

Land use history in the Everglades may be divided into two periods identified by a "B.C." and an "A.D." of special meaning. "Before Canals" land was too wet to cultivate. "After Drainage" it sometimes was too dry.

In the last 40 years, and particularly between 1913 and 1929, the Everglades were furrowed with hundreds of miles of costly canals. Drainage was overextended—at least from the farmers' point of view. Under construction today are check dams and locks which promise better balanced water control (page 147).

Largest agricultural operator in south Florida is the United States Sugar Corporation at Clewiston, on the southwest shore of Lake Okeechobee. The U.S.S.C. is the major producer of raw cane sugar in the continental United States (Plates VI and VII).

East and west of Clewiston, in an arc around the lake shores, the company owns 150,000 acres of land. A fifth of these holdings are in sugar cane production.

"We ship enough raw sugar every year," vice-president Josiah Ferris, Jr., informed me (before the end of sugar rationing), "to cash the civilian ration coupons of every man, woman, and child in the United States for 30 days."

The company cuts a million tons of cane a year, which yield approximately 100,000 tons of raw sugar.

The corporation devotes 20,000 acres to cattle pasture and agricultural crops other than sugar cane. For Newport Industries, Inc., it grows ramie, versatile "new" fiber that seems destined for large-scale development for

William H. Bischoff

Motionless as a Floating Log, a Big Alligator Lies in Wait for Unwary Waterfowl, Fish, or Small Mammals

He is not choosy about his diet; he will eat anything that flies, walks, crawls, or swims, and is small enough for him to kill. This specimen, now in captivity, was taken in the Everglades. Alligators more than four feet long still may be hunted in many Florida counties during a nine-month open season. Nine counties give the long-victimized creatures year-round protection by law.

nets, twines, fabric fire hose, packings, and upholstery—even for cigarette papers and vitamin A.

A sign beside farm buildings just west of Clewiston read: "Sugarland Ranch, Home of Molasses Fed Beef."

"What's this about cows eating molasses?" I asked Mr. Ferris.

"Come out on the range and I'll show you," was the rejoinder.

Astride his favorite horse, Cracker Boy, Ferris followed the jeep I shared with the head rancher. We took a sack of cottonseed pellets to throw as bait to the bovines.

A mixed group of Brahman, Angus, Hereford, and Shorthorn cattle had their heads in a feed trough.

"There you are!" grinned Ferris.

Sure enough, the blocky animals were lapping blackstrap molasses with all the gusto of pickaninnies ear-deep in watermelon (Plate XIV).

"We've found that blackstrap, supplemented with proper roughage, adds pounds to steers like bonbons plump a dowager," Ferris stated. "Sweets spoil human appetites; molasses makes our cows hungrier."

U. S. Sugar's Sugarland Ranch pampers 5,000 cattle in four purebred herds on 4,400 acres of improved pasturage.

Truck Gardening Is Big Business

Agriculture has boomed all around the south and east shores of Lake Okeechobee, ringed with a broad band of deep, organic muck. Bumper winter crops of green beans, cabbage, escarole, celery, radishes, peppers, eggplant, lima beans, peas, potatoes, and lettuce are annually bringing wealth and work to this thriving region.

Farming still is something of a gamble, however, for floods and frosts inflict heavy damage almost every year.

Despite climatic uncertainties, demand for south Florida winter truck crops has made Belle Glade one of the largest vegetable shipping points in the United States.

Palm Beach County, where most of these Everglades agricultural lands are situated, is one of the major vegetable-producing counties in the United States. Last season, 13,300 carloads of fresh vegetables rolled away from the lake area alone. Truck shipments swelled the totals cleared to hungry markets.

R. Y. Creech, Belle Glade farmer, took me out to black-soil fields where workers were cutting the last of a whopping crop of Pascal and Golden celery. They were taking out 700 crates to the acre!

George Espenlaub of Clewiston guided me to ancient Calusa Indian remains "lost" in the Everglades south of town.

The pre-Seminole Tony Mounds rise only five to ten feet above surrounding flatlands. Built along one of their canoe routes by aboriginal Calusas, the primitive earthworks are eroded and grass-grown.

Returning, "we" captured alive a three-foot cottonmouth moccasin with snake hook and bare hands. (My part in this exploit was simply to "let George do it!")

George regaled me with yarns of snake-hunting trips. He sells reptiles to live snake exhibitors.

Capturing Snakes by the Mile

Later, in Miami, I met a man who lives on snakes—not eating them, but selling them, made up in handbags, shoes, hats, belts, and wallets.

Edward B. Mulloy, owner of the Florida Reptile Craft Company, does a volume trade in snakeskins mostly taken in the Everglades.

"Last year," he told me, "I handled over seven miles of snakeskins, mainly cottonmouth moccasins, green and banded water snakes, and king snakes. They have the handsomest patterns and are very strong.

"On a five-day trip, with two helpers and three days of hunting," Mulloy calculated as he spoke, "a good catch would be 900 snakes. It's a fair take if we get 3,000 feet of skins."

"How do you catch 'em?"

"We capture all except rattlers and kings at night, spotting our quarry with lights strapped to our foreheads. We pick up snakes in the water with tongs like the grocery hook the clerk uses to pull down boxes of cereal. On land, we press down on the snake's neck with the curved wire head of a T-stick, then grab him with thumb and forefinger."

"If you get stuck in the swamp and run out of grub, what can you eat?" I inquired.

"Well, roast wild pig is nice. I've killed them with bow and arrow. Spearing frogs is easy, and their kickers are mighty sweet.

"In canals and sloughs we jump soft-shelled turtles. Tail of gator makes good stew [alligator hunting is legal in many counties], and I wouldn't pass up rattlesnake fillets.

"Heart of cabbage palm, cooked or in a cold salad, soothes my palate. And in season wild turkey and deer are not too hard to come by. Then, if you like fish . . ."

"Stop, please!" I implored. "My mouth's watering!"

C. Kay Davis, at that time district conservationist of the U. S. Soil Conservation Service, wanted us to see the Hillsboro Marsh area west of Delray Beach, a "valueless" area scheduled for protection as a wildlife refuge.

"How do we get around out there?" I asked.

"We have a brace of air boats," Davis said. "They can step over that half-drowned grass."

On the "shores" of a vast swamp we met the air boat, water plane, or "whooshmobile." This is a flat-bottomed, square-ended craft with an old auto engine mounted astern in a latticework of rods and struts (Plate IX).

The motor drives an airplane propeller which blasts air backward and thus shoves the boat forward—at speeds up to 50 miles an hour! It took both craft to hold our party. Our pilots were old hunters, Lewis ("Cal") Henderson and Johnny Lamb.

From a narrow reedy channel we suddenly burst out upon the open marsh. A film of water lay on the land. From the saw grass wild carrot lifted dry flower clusters. Islands of myrtle, bay, and Florida holly framed lakelike expanses strewn with waxy spider lilies.

Lamb and Henderson opened the throttles. Like huge angry water bugs the yellow air boats leaped across the shallows. White wakes foamed to either side.

"The Ashley gang of bank robbers hid out here," Johnny Lamb shouted. "They wuz never caught till they went outside."

"Recently as the early twenties," Davis added, "if you ran into a stranger in these swamps, you didn't just casually ask his name. If he volunteered his moniker—O.K.!—but it probably wouldn't be his right one, anyway."

Weeks before, an old Seminole headman had given us a placid ride in his cypress dugout canoe, vanishing symbol of the Everglades. Now here we were skating along in an ingenious travel contraption at 40 miles an hour!

While the whooshmobile trip certainly was tops for speed, zing, and thrills, it ran a poor second to the cypress pirogue for a quiet, restful cruise.

Perhaps the contrast epitomized the Everglades, where the new Everglades National Park strives to restore "waste" land to unspoiled conditions of 60 years ago, and where farmers and ranchers rush production of cattle, truck crops, fruits, fibers, and sugar cane.*

* See, in the National Geographic Magazine, "Florida—The Fountain of Youth," by John Oliver La Gorce, January, 1930; "South Florida's Amazing Everglades," by John O'Reilly, January, 1940; and "How We Use the Gulf of Mexico," by Frederick Simpich," January, 1944.

Staff Photographer B. Anthony Stewart

Northwestern Indians Built Hewn-plank Houses Long Before the White Man Came

A Yurok girl emerges from the "doorway" of a 200-year-old lodge in northern California. From there to Alaska, natives used horn wedges to split planks from fir or redwood trees for this type of house. Wall boards, lashed by grapevine cords to horizontal "beams," stand two feet in the ground. Door panel is four feet wide.

Indians of the Far West

By Matthew W. Stirling *

Chief, Bureau of American Ethnology, Smithsonian Institution

BETWEEN the Wasatch Range of Utah and the foothills of the Sierra Nevada the traveler gazes down from his high-flying plane upon what seems to many a panorama of complete desolation—the great American desert.

Mile after mile of saline flats and sagebrush plains unfolds west of Great Salt Lake, where a century ago hundreds of covered-wagon pioneers left their bones and those of their oxen to bleach along torturing trails.

The Great Basin was an implacable enemy to white men then. Even now, though crossed by railroads, airlines, and motor highways, much of it seems unfit for habitation by man or beast.

Indians Prospered Where White Men Starved

Yet from this forbidding, inhospitable waste, a generation before the white man came, some 10,000 Indians wrested a living and in their way prospered.

They did this without agriculture; without irrigation; without tools, save crude implements fashioned from sticks and stones; without horses and cattle; without even adequate clothing or shelter from the severe cold of winter or the blazing heat of summer.

Nowhere in human annals can be found a more striking example of man's adapting himself to an unfriendly environment than that furnished by the tribes of the Great Basin.

The Indians of the Far West, living between the Rocky Mountains and the Pacific coast, were in general the most primitive within the present boundaries of the United States. Of all the Far West tribes, those of the Great Basin, which embraces Nevada, part of Utah, and portions of bordering States, were most backward.

Tribes living in the region drained by the Columbia River and its tributaries had better sources of food and therefore reached a slightly higher level.

In the Pacific coast region between the Sierra Nevada-Cascade Range and the ocean abundant natural resources and genial climate made living conditions easy.

Unlike the forest-dotted and low level region east of the Mississippi River, the Far West is a land of tremendous topographic diversity. For instance, in the corner of the Great Basin which extends into southern California, Mount Whitney and Death Valley, highest and lowest points in the United States, are within sight of each other.

The Indians of the Far West were as diversified as the topography.

They lived principally on nuts, wild seeds, and roots. They had no buffalo to lead them afar on the chase, as had the eastern tribesmen. Rugged topographical barriers circumscribed their movements.

Great Basin Indians belong almost exclusively to one linguistic stock, the Shoshonean. The principal tribes were the northern Paiute of western Nevada and southeastern Oregon, the Shoshoni of central and eastern Nevada and near-by Utah, the southern Paiute of southern Nevada and adjacent Utah, and the Ute of eastern Utah and western Colorado.

Not until about 1840 did the real period of white immigration into the Far West begin. Starting with the caravans following the Oregon Trail and the Mormon settlements around Great Salt Lake, this white invasion reached its peak in the California gold rush. The most direct routes traversed the heart of the Great Basin.

Tens of thousands of gold seekers crossed the desert during the years of the rush, but their passing had little effect on the Indians. The white men, sticking to the main trails, were concerned only with their goal beyond the Sierras.

The diaries of these pioneers make little mention of the natives save to call them "Diggers," a contemptuous name referring to their root gathering.

Within a few years after the discovery of rich mines in western Nevada prospectors penetrated to every corner of the Basin, and

* This is the sixth in a series of authoritative articles by Dr. Stirling on the American Indian, illustrated with W. Langdon Kihn's paintings. For many years Mr. Kihn has been acclaimed in America and Europe as a distinguished painter of Indian subjects. He was commissioned by the National Geographic Society to illustrate the comprehensive series on American Indians. To gather data, he traveled to Indian reservations, excavation sites, and over areas populated by Indians long before the white man came, noting costumes, customs, scenic backgrounds, utensils, and jewels of the tribes shown. Thus the paintings combine artistic beauty with a wealth of accurate information. See, in the National Geographic Magazine: "America's First Settlers, the Indians," November, 1937; "Indian Tribes of Pueblo Land," November, 1940; "Indians of Our Western Plains," July, 1944; "Indians of Our North Pacific Coast," January, 1945; and "Indians of the Southeastern United States," January, 1946.

in their wake came settlers to occupy the limited watered areas.*

Grazing livestock reduced the edible plants, and the white man began cutting down for fuel the piñon trees, the red man's most important source of food.

With recently acquired horses and guns the Indians put up a stern resistance for a while. But when the transcontinental railroad across Utah and Nevada was completed in 1869, the aboriginal way of life was doomed.

Wovoka, Originator of the Ghost Dance

In this period was born in Mason Valley, western Nevada, a Paiute of lowly origin who became known as Wovoka, "the Cutter." He never left his little native valley. Although industrious and of good character, he was undistinguished as to intellect and was not particularly aggressive.

Nevertheless, in his early thirties he became one of the most influential Indians in North America. From the Gulf of Mexico to the Canadian border pilgrims came to see him in his little dome-shaped tule hut.

Wovoka was the originator and prophet of the famous Ghost Dance movement, which excited great unrest among the tribes of the Plains.

About 1888 Wovoka, already a medicine man of local reputation, had his great revelation. While he lay ill with a fever, an eclipse of the sun caused much superstitious awe among the Indians.

Wovoka believed that his soul had traveled to the spirit world and there consulted with the god of the Indians.

It was revealed to him that the Indians would regain their ancient inheritance and would be rejoined by their departed relatives and friends (Plate III).

Wovoka was given a set of songs and dance ceremonies which he was to instruct the Indians to practice so that they might be ready for the great day of deliverance. He attributed no supernatural powers to himself, but considered that he had been chosen as prophet to herald the coming restoration.

The new movement spread like a conflagration from Nevada to the tribes east of the Rockies, and culminated in the massacre at Wounded Knee and the killing of Sitting Bull in 1890.

Among the American Indians many such messianic movements arose in the wake of white domination. The great Pontiac Conspiracy (1763-65) had such an origin.

Travelers who had encountered the colorful Plains and Pueblo tribes expressed scorn for the lowly Shoshoni of the Great Basin.

They described them as living at the level of animals, always half starved, hibernating without food like bears in caves, whence they emerged in the spring, crawling on hands and knees to eat grass.

In most of the Great Basin rainfall was scanty and food scarce. Summers were extremely hot; winters, extremely cold. The Indian had to utilize every form of food he could obtain.

To the disgust of early observers the Shoshoni ate crickets, lizards, snakes, gophers, and roots. However, since the selection of items of diet is determined largely by custom, a Shoshoni might be just as annoyed at seeing a white man eating a crab or a lobster.

Vegetarians of Necessity

Nuts of the pine tree, or piñon, were the most important food. Abundance of this fall crop determined whether the Indians would pass the winter comfortably or in semistarvation. The entire family participated in gathering pine nuts during a period ranging from 10 to 20 days. If the crop was abundant, an adult could gather approximately 50 pounds a day.

In the southern part of the Great Basin, where the elevation was lower and the climate warmer, the mesquite bean and the agave, or century plant, were valuable foods. Seeds of many grasses, such as wild rye, also were eaten.

Mesquite beans were gathered in the summertime. The seeds were taken from the pods and ground into flour on crude stone mortars.

The agave was prepared in the south by roasting in stone-lined pits. When cooked, the stringy flesh of the plant is almost molasses-sweet.

Big game animals were relatively scarce and hard to obtain.

Families Joined in Jack Rabbit Drives

Over most of the Great Basin jack rabbits were abundant and easily caught. From their skins were made robes, the principal winter garment of the Indians.

The rabbits were usually taken in community drives. Nets made of cords of twisted grass were strung in a quarter-mile arc. Entire families spread themselves out in a line. Approaching the net, the hunters beat the brush and drove the rabbits before them into the barrier.

When the unrolled ends of the nets were

* See "Nevada, Desert Treasure House," by W. Robert Moore, National Geographic Magazine, January, 1946.

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Chief Joseph, Somber Leader of the Nez Percé, Was the Xenophon of American Indians

His masterful retreat of more than 1,000 miles in a war with U. S. troops in 1877 has been compared to the ancient Greek's famous retreat of the Ten Thousand. Military and tactical skill won Joseph the title "greatest of Indian strategists." He was noted for humaneness in warfare. The "pierced noses" lived along the lower Snake River and its tributaries in parts of present Idaho, Oregon, and Washington.

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Umatilla Indians Sing and Sway in the Red Man's Version of "Button, Button, Who's Got the Button?"

Players sit in two facing lines; "buttons" are small bone cylinders. Members of one team, chanting and swaying, pass them along. The opposing leader guesses who holds an unmarked one. If successful, he wins a counting stick and leads his team in concealing the bones. The side capturing all the counting sticks wins. Players pile bets—money, blankets, beads—before them; winning team divides the spoils. Indians are inveterate gamesters; their games often stem from remote religious ceremonies. This "hand game," known to 81 Western tribes, is still played. Man at right beats on a log to keep time.

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By a Campfire's Eerie Light the Prophet Wovoka Spellbinds His People with Promises of Life after Death

Late in 1888 the moody young Paiute medicine man fell ill. During a solar eclipse his fevered brain imagined a journey to the spirit world. He "returned" to preach that peace and virtue would reunite Indians with departed loved ones in a happy land. Chief ritual of the cult was an elaborate Ghost Dance, during which frenzied devotees often went into lengthy trances. From Nevada the new religion spread east to the Missouri River. Its doctrines helped cause a Sioux uprising in 1890. At times local agents prohibited the dance to avoid disorder. Many Western Indian dances still use Ghost Dance features.

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High on the Columbia River's Black Basalt Banks, Dalles Indians Show Lewis and Clark a Way Through Its White Water

Some 200 miles from its mouth the mighty river swirls and boils through The Dalles, a narrow gorge it sliced through ancient lava flows. Here in October, 1805, the intrepid explorers arrived on the last leg of their westward trip. Guided by local braves, they scaled the lofty rocks, decided to shoot the roaring rapids. Their report understates: "This we attempted, and with great care were able to get through." The expedition brought back the first detailed information on Northwest Indians. Behind Lewis and Clark stand Charbonneau, an interpreter, and his heroic, papoose-carrying wife, Sacagawea.

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With Flint Tools and Patient Skill Chumash Indians Made the New World's Only Planked Canoes

The west coast's foremost mariners, the Chumash inhabited the mainland and large islands of southern California's Santa Barbara Channel. Lacking big trees for dugout canoes, they split planks from driftwood. These they shaped, scraped, and smoothed. Along the edges they drilled holes, "sewed" the planks together with fiber cords. Asphalt calked the seams and holes; shells and paint provided decoration. Flat-bottomed "keel," sternposts, and a thwart amidships formed the frame. Double-bladed paddles shot the light craft through the water. They varied from 12 to 22 feet in length, carried from two to 10 fishermen. Bearskin-clad figure is the skipper.

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From the Seeds of the Great Yellow Water Lily Oregon's Klamath Indians Made *Wokas*, a Highly Prized Cereal

The supply was enormous; Klamath Marsh alone had 15 square miles of solid water-lily growth. Here workers in long dugout canoes pick unripe seed pods. They will sun-dry, pound, and winnow them. The meal was a vital staple which could be stored for a long time. Pickers averaged four to six bushels of pods a day, which yielded only six or seven pounds of wokas. The Klamath were a hardy people, who never took the warpath against the white man. Before 1864 they raided other tribes to capture female workers. Slavery was a notable institution among them.

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Braced on His Ancestral Fishing Stand, a Columbia River Indian Nets Salmon in the Churning Waters of Celilo Falls

Long before Lewis and Clark portaged around the falls aboriginal fishermen handed down these outjutting platforms from father to son. From similar platforms on the same sites modern Indians, dressed in dungarees and crew shirts, scoop up fish. By an old treaty they enjoy exclusive and perpetual fishing rights at this spot. In the spring, when salmon run and water is high, the narrow Dalles downstream back the river up until Celilo Falls becomes a short, watery arc (Plate IV). Salmon was Columbia River Indians' chief food and commodity of trade.

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Rush-mat Lodges and Drying Salmon Mark a Peaceful Wanapum Fishing Village

It stood on the Columbia River in eastern Washington. The single-room lodges, supported by forked poles, were 15 to 60 feet long. A foot-wide opening ran the length of each roof to let out smoke and admit light. The vast quantities of fish drying on scaffolds amazed Lewis and Clark when they visited this village in 1805.

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In the Natural Trenches of California's Lava Beds Warlike Modoc Made a Bitter Last Stand

Resentful of reservation life, they defied Uncle Sam and returned to ancestral lands astride the northern California border in 1872. When blue-coated U. S. troops arrived, the wily Modoc took to the lava beds. There they held out some four months, inflicting heavy losses on the attackers. The Modoc were related to more tractable Klamath Indians of southern Oregon (Plate VI).

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Stocky, Bark-skirted Pomo Women of Coastal California Were the Continent's Star Basket Weavers

They were probably unrivaled among North American Indians in variety of technique and range of patterns. Feathers, beads, and stone pendants embellished their best work. Men did the coarser weaving jobs, leaving their spouses free to achieve real art. Peace-loving Pomo were also chief minters for a large area, making highly valued currency from giant clamshells and magnesite. They also developed a moon calendar and a counting system which used a unit of 100 fours. Although a coast and mountain-lake people, they were content with crude rafts instead of boats. The girl at right fondles a feathered masterpiece.

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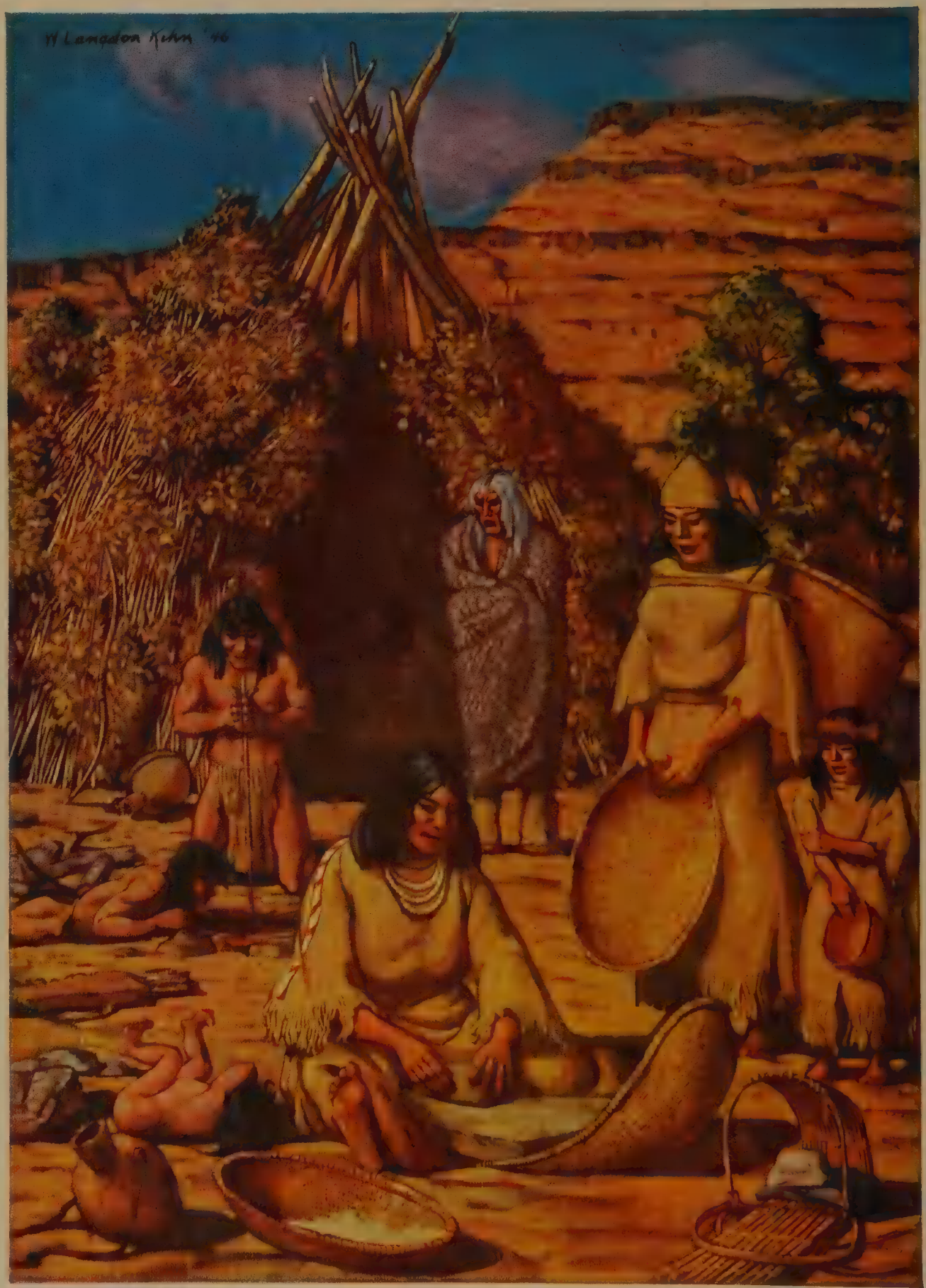
Arrayed in Savage Splendor, Dancers of a Secret Cult Meet Before Their Round House for an Earth-preserving Ceremony

Begun by southern Wintun Indians, the cult flourished in central California. Members held a series of dances from October to May. Indians believed the world would disintegrate if they ceased. Kuksu, or "big head," Dance gave the cult its name. Pincushionlike headdresses measured four feet across; feathers or poppies tipped the slender rods. Dancers carry flag, bird-bone whistle, magic staff, gourd rattle, and bow and deer-head quiver. Stamping on a large foot drum, they danced inside the ceremonial lodge. Selected boys became novices at a tender age and were initiated on reaching manhood.



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Seeds Gathered from Their Semiarid Plateau Were the Staple Food of Wandering Paiute

They roamed the high lands between California's Sierra Nevada and the southern Rockies. Into the 1870's they lived a primitive existence, unchanged for countless centuries. Their few utensils, even to water jars and cooking pots, were woven. Woman in center grinds hard-shelled seeds into meal; her supplier carries two-bushel gathering basket on back. At lower right is child's hooded cradle.

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Beneath Verdant Palms Strong-backed Cahuilla Women Bow under Stacks of Golden Reeds

Carrying-nets with forehead straps, an innovation of southern California Indians, hold the loads. Basket hats prevent chafing. With their teeth the women will split each reed three ways for use in making baskets. Nonfarming Cahuilla, like the Paiute, were food gatherers; their varied desert-and-mountain region provided more than 60 plant foods. Palm is the native *Washingtonia.*

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Thatch-topped Hupa Tribesmen, Skillful Hunters of the Deer, Ushered in the New Year with the White Deerskin Dance

Carrying treasured albino skins on long ceremonial poles, they line up for the finale of the colorful 10-day ritual. Hupa lived in pleasant Trinity River Valley in northwest California. Each September, dancers progressed along the river giving various "acts" of the dance in tribal villages en route. To get within easy bowshot of game, Hupa hunters removed man odor by bathing and smoke, and disguised themselves in common deerskins. So well did they play the part that panthers sometimes pounced upon them. Chief dancers, wearing crowns of sea lion tusks, carry sacred obsidian knives. Shell beads adorn the dancers' necks.

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After Mass on Sundays Costanoan Converts of the Mission of St. Francis Kept Alive Their Ancient Tribal Dances

Founded in 1776 by Spanish priests, the mission gave the city of San Francisco its name. Now known as Dolores Mission, its well-preserved chapel still stands within the city's limits. A lithograph by the artist of Russia's first round-the-world expedition, which stopped here in 1805, is the basis for the scene above. Vultures' tail and wing feathers made the dark ceremonial bonnets. The two middle tail feathers of a species of woodpecker formed the white headbands; as many as 450 were required for a single band. Costanoans, now extinct, lived along the California coast from Monterey to the Golden Gate.

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Dressed in Beaded Finery, a Yakima Girl Rides High in Her Spanish-type Saddle

Her people lived on both sides of the Columbia River and along the Yakima and Wenatchee Rivers in Washington. She wears a beaded elkskin cape, basket hat, and marine-shell earrings. Otterskin wraps her long braids and forms the wrist loop for a quirt. A high, decorated pommel stands up before her. Among Indians only women used saddles.

drawn across the opening of the arc, they were easily dispatched with wooden clubs.

In another method the hunters carried torches and formed a large circle. The brush was fired to burn toward the center. The hunters converged until they could kill the dazed rabbits with clubs.

Cottontail rabbits, gophers, squirrels, rats, and marmots were also eaten. Deer were stalked singly and shot with bow and arrow, as were mountain sheep.

The fast and wary antelope was taken in community drives. A stout corral about 200 feet in diameter was built in a valley where the animals were expected. Wide converging wings of brush were put up for the entrance. The antelope, driven by the hunters and guided by the wings, entered the corral and were shot with bow and arrow.

In long-past geologic ages the Great Basin was a region of lakes and lush forests. When man first entered the scene we do not know, though scattered excavations in caves and near the old lake terraces indicate that it was several thousand years in the past.

Until A.D. 1500 bison ranged most of Utah and northern Nevada, but by the middle of the 19th century they had entirely retreated from the Great Basin area.

Indians Ate Grasshoppers

There were occasional seasons when Mormon crickets, or longhorn grasshoppers, appeared in large swarms. When this happened, the Indians collected enormous quantities for food by encircling an area with converging fire. The singed insects accumulated in piles in the center.

Lizards and snakes were staple articles of diet. The chuckwalla, a large lizard which lives only in the southern part of the Basin, was most eagerly sought (page 195). Strangely, the rattlesnake, one of the largest and more palatable snakes of the region, apparently was not used.

Indians fished along the Humboldt River and the streams near Great Salt Lake. In these areas fish could be caught in the winter, when other sources of food were cut off, by spearing or in weirs.

Most Great Basin tribes were skillful basket weavers. They collected wild seeds and roots in large conical carrying baskets and processed them in basketry trays (Plate XII). To carry water on long trips into arid sections, the Indians wove watertight baskets.

Living in widely scattered groups, the Great Basin tribes were so preoccupied with the food quest that they had little time for dances, which were held infrequently, usually when the food supply was temporarily abundant. For these occasions many families gathered at a rendezvous for a week or two. Participants in the simple round dance joined hands in a circle. Games of chance were a favorite pastime.

These gatherings were the normal time for courtships, and most marriages resulted from them.

Since the two sexes were not always equal in number, it was common for a man to have two or more wives; sometimes a woman would have more than one husband. The taking of sisters or brothers as plural spouses was considered a wise precaution against jealousy.

The Coming of the Horse

The horse, which had been introduced by the Spaniards into the Southwest in the 16th century, reached the Great Basin Indians early in the 19th century and profoundly affected their manner of living.

The Ute were a warlike people with considerably more tribal organization than their western Shoshonean neighbors. At one time the seven divisions of the tribe in Utah were organized under a single leader.

Horses increased their warlike activities and brought them more into contact with the Plains tribes from whom they learned to use clothing, tepees, and rawhide and leather containers (page 197).

The horse had already reached the Columbia before Lewis and Clark arrived there in 1805.

A Shoshoni Heroine

When the explorers reached the Hidatsa villages on the upper Missouri they hired Toussaint Charbonneau, a French-Canadian voyageur living among the Indians, to act as interpreter and guide.

Charbonneau's wife was the famous Shoshoni Sacagawea (Plate IV).

The Hidatsa had captured her when she was a young girl and had sold her to Charbonneau when she was about fourteen. Because of her knowledge of the Shoshoni country and her good character, she was extremely useful to the expedition and won the high regard of its captains.

The first band of Shoshoni encountered was in charge of Sacagawea's brother. Through her intercession the explorers obtained horses from the Indians.

Speaking of the fight during which Sacagawea was captured, Captain Lewis wrote in his journal: "Sah-cah-gar-we-ah our Indian woman was one of the female prisoners taken at that time tho' I cannot discover that she

C. Hart Merriam

To His Secret Round House Goes a "Big Head" Dancer

He will back in with head bowed to protect his four-foot bonnet. Inside he will light the ceremonial fire for a dance of the secret Kuksu cult of central California Indians (Plate XI). Dr. C. Hart Merriam, who saw the dance and took this picture, was a widely known naturalist and authority on Western Indians. He was a founder and for 54 years (1888-1942) Trustee of the National Geographic Society.

shews any immotion of sorrow in recollecting this event, or of joy in being again restored to her native country; if she has enough to eat and a few trinkets to wear I believe she would be perfectly content anywhere."

A son was born to Sacagawea in the course of the journey, but this event did not hinder her services to the party.

The northeastern Shoshoni had penetrated to the upper Missouri River. There they had taken on many of the traits of the buffalo-hunting Plains tribes, using tepees and dancing the characteristic Sun Dance.

Farther west in the sagebrush country they lived more like their neighbors of the Great Basin. Their dwellings were rude brush shelters, often merely roofless semicircles, which served as windbreaks and gave only scant protection against snow and rain in winter. They also used caves in the lava beds as shelters.

The Nose-piercing Tribes

Traveling westward from the Shoshoni, Lewis and Clark encountered the Nez Percé tribes, which occupied the valleys of the Snake River and the Columbia as far as The Dalles. French trappers so named them because of their custom of piercing the septum of the nose to receive a shell ornament.

West of the Nez Percé, the other principal tribes were the Walla Walla, the Palus, the Umatilla (Plate II), the Tenino, the Yakima (Plate XVI), and the Klikitat.

When Lewis and Clark reached the Nez Percé, these Indians were living in community houses containing as many as 50 families. They also used underground houses, roofed over with sticks and earth, which accommodated from two to four families each.

Variations of the semi-dugout house were typical of the Northwest and extended well into California.

A large ceremonial or dance house was usually built for each village.

The Nez Percé believed in many Nature spirits and private guardian spirits which could be obtained by any individual through fasting.

They were courageous fighters and produced Chief Joseph, one of the most admired American Indian leaders (Plate I).

By the treaty of 1855 they ceded much of their tribal territory to the United States and were assigned to a reservation in the Wallowa Valley in Oregon and part of Idaho. With the sudden increase of white immigration they were still further restricted and ordered in 1863 to a much smaller reservation in Idaho.

Those living at Wallowa Valley refused to recognize the new treaty. Under the leadership of Joseph they won several decisive victories over United States troops.

When, outnumbered and underarmed, they were obliged to give way, Joseph conducted a retreat with his entire band of men, women, and children that remains a masterpiece of generalship.

With Col. Nelson A. Miles and his troops ahead of him, with Gen. O. O. Howard at his rear, and Col. S. D. Sturgis on his flank, he led his little party more than a thousand miles through Montana to within 50 miles of his objective, the Canadian border. Here he was finally cut off by fresh troops and surrendered.

Staff Photographer B. Anthony Stewart

Prized Delicacy of Great Basin Indians Was a Fat Chuckwalla

Tom Wilson, a Paiute, examines *Sauromalus obesus,* a lizard which lives among the sun-baked rock ledges of the Southwest (page 193). Excepting the Gila monster, it is the largest species definitely known from the United States. Herbivorous and egg-laying, it grows to 17 inches in length. When attacked, the chuckwalla scurries into a crevice and blows himself up until his scaly hide is tight against its rock walls. To get him out is a problem.

Joseph's speech at the time of his surrender expresses the hopelessness that came to tribe after tribe as they retreated before the inexorable tide of white advance.

"I am tired of fighting," he said. "Our chiefs are killed. Looking Glass is dead. Toohulhulsote is dead. The old men are all dead. It is the young men who say yes or no. He who led the young men is dead. It is cold and we have no blankets. The little children are freezing to death.

"My people, some of them, have run away to the hills and have no blankets, no food. No one knows where they are—perhaps freezing to death. I want to have time to look for my children and see how many of them I can find. Maybe I shall find them among the dead.

"Hear me, my chiefs.

"I am tired. My heart is sick and sad. From where the sun now stands I will fight no more forever."

The Flatheads, a Salishan tribe, occupied most of western Montana. The name flathead was bestowed, not because they deformed their heads, but because, unlike their neighbors to the west, they left their skulls as Nature formed them—flat on top.

They relied largely on fish for food but were active hunters as well. Their houses were underground dugouts with poles converging to form the roof. Cedar-bark mats were laid over these poles and covered with earth.

California's Complex Tribal Patterns

California comprises one of the most complex ethnological areas in the New World. Formerly it was supposed that as many as 22 different languages were spoken within the boundaries of the present State of California. But in more recent times linguists have grouped a number of these local languages into two chief stocks, Hokan and Penutian, and thus reduced the total number to 12 at most.

On the northwestern coast of the State two of the great linguistic stocks of America, the Athabascan and the Algonquian, are represented by a few small groups.

Just south of the Athabascan tribes are two small groups, the Yuki and the Wappo, who speak a language which so far as can be determined is related to no other in the world.

The physical structure of the Yuki also sets them apart from all other tribes. They are exceptionally short in stature and have unusually long heads.

Typical in northwestern California are semi-subterranean plank houses and dugout canoes with raised prows.

Money consisted of shells or strings of clamshell beads. Big flaked obsidian knives symbolized large sums of money (Plate XIV).

The distribution of this type of culture corresponds more or less to the high redwood and fir forests of northern California, which are a continuation of the heavy forested area of the Northwest coast.*

If any tribes were typical, they were those in the central part of the State speaking Penutian dialects—the Maidu, the Wintun, the Miwok, the Yokut, and the Costanoan.

Farther south the Shoshonean linguistic stock of the Great Basin pours across the eastern border of the State. It includes such tribes as the Mono, the Chemehuevi, the Cahuilla (Plate XIII), and the Gabrieleño. The latter took up residence on the southern Santa Barbara islands.

Central California an Indian Promised Land

From the tribes of northern Mexico and the Pueblo tribes of the Southwest the extreme southern California tribes, the Mohave, the Yuma, the Kamia, and the Diegueño, learned to grow maize, beans, and squash and to make pottery of good quality. These were the only groups in California possessing real tribal solidarity.

Central California is the area lying between the foothills of the Sierras and the coast. The principal topographic features are the great Central Valley drained by the Sacramento and San Joaquin Rivers and the relatively low Coast Ranges which separate it from the ocean.†

The climate, as has been hinted by many chambers of commerce, is delightful.

Here were nearly perfect living conditions for primitive man. Deer and elk abounded; rabbits and squirrels were everywhere. Marshes and lakes teemed with waterfowl, the rivers were full of fish; and along the seacoast, in addition to fish, there were clams, mussels, abalones, crabs, and crayfish.

In the Plateau area to the north, if the salmon run failed, famine followed. In the agricultural Pueblo region to the south, if the rains did not come in time, starvation resulted. But famine was virtually unknown in central California.

Wild grass seeds and roots and bulbs were gathered in season. When the aborigine wished to vary his diet, there were also grasshoppers, angleworms, caterpillars, yellow-jacket larvae, and delicious beetle grubs.

Although the region is now one of the most productive in the world, the practice of agriculture was unknown to the Indians of this part of California. With such a variety of food sources the Indian here did not need to fear the failure of any one crop.

Acorns the Staff of Life

Numerous oaks produced each year large quantities of acorns, the staff of life of the California Indian. There also were pine nuts and buckeyes and the nut of the California laurel.

Acorns were gathered in the fall and carried to camp or village in baskets. They were then dried and stored in large baskets or granaries placed on platforms.

When ready for use they were hulled and ground to flour in the stone mortar, or in later times on a slab of rock.

Since the acorn in its natural state has a high tannic-acid content, making it extremely bitter, a leaching process was necessary before cooking. This was usually done by placing the meal in a basin of sand and pouring water over it. A lazier way of accomplishing the

* See "California's Coastal Redwood Realm," by J. R. Hildebrand, National Geographic Magazine, February, 1939.

† See "More Water for California's Great Central Valley," by Frederick Simpich, National Geographic Magazine, November, 1946.

Bureau of American Ethnology

Laced to the Chin in His Elkskin Cradle, a Small Ute Brave Naps while Sister Poses Him

J. K. Hillers, famed early photographer of Indians, made this picture some 75 years ago while accompanying Maj. John W. Powell on his explorations of the Southwest. His results were excellent despite cumbersome equipment and difficult field conditions.

Bureau of American Ethnology

The Tepee-dwelling Cayuse of Washington and Oregon Bred Tough Little Ponies Which Took Their Tribal Name

The wiry "cayuse" pony became famous throughout the West. Full-blooded Cayuse Indians had disappeared by 1902. Blaming white men for an epidemic in 1847, they

leaching was to bury the hulled nuts in the mud of a swamp for a year.

After the meal had been leached, it was mixed with water in a basket until it had the consistency of a fairly thick soup. Hot stones dropped into the container caused the mixture to boil. Thus cooked, it was ready to eat.

In central California the buckeye was pounded and leached in much the same fashion as the acorn.

Indian Fashions of California

In keeping with California's mild climate, the clothing of the Indians was simple. In aboriginal times men as a rule wore nothing. When the weather was cold they wore a skin wrapped around the hips.

Women in all parts of California wore double aprons. A small apron was suspended from the waist in front and a larger one behind.

Where deer were available, these were made of buckskin, usually with a fringe along the bottom. Shredded bark, grass, or fiber cordage had to suffice in localities where leather was lacking.

The usual footwear of the central tribes was a sock made of a single piece of dressed deerskin and sewed up the front and back. Moccasins were worn only on special occasions, such as war expeditions and long trips.

The tribes of southern California wore sandals, often made of twisted ropes of agave fiber.

As basket weavers, the California tribes are without peers in all the world.

In the north, weaving or twining techniques are used; in the south, coiling is the predominant form.

Basket weaving reached its peak among the Pomo, who practiced a wide variety of weaving techniques and produced the beautiful feathered baskets generally considered the finest examples of the basket-weaving art (Plate X).

Despite this weaving skill, nothing resembling cloth was produced in California. The twisting of rabbitskin strips or feathered strips of bird skin into robes and the twining of tule mats are the nearest approach to it.

Medicine Men and Specialists

Many California tribes had chiefs whose position was hereditary. The individuals with the most power were the medicine men, who could make their fellows believe they could cure or inflict disease. Many were supposed to gain the aid of spirits; others were specialists.

For example, there were medicine men whose only function was to cure or prevent snake bites. Some snake doctors performed a ceremony in which live rattlesnakes were handled.

The bear doctor claimed the power of killing enemies by turning himself into a grizzly bear. Such practitioners were greatly feared.

In the northern part of California the medicine man diagnosed illness, which he cured by sucking out of the patient the object which had caused the disease by invading the body. Such objects might be a piece of flint, a live lizard, or a spider.

By collecting poison from reptiles, insects, and plants and mixing it with some part of the intended victim, such as a hair or a nail paring, the poison doctor, it was believed, could cause death.

This idea of parts of the body being connected with controls by other persons was widespread in California. An old Indian woman of my acquaintance had a bag filled with toenail and fingernail parings which she had saved all her life, fearing lest they fall into the hands of an unscrupulous person who might harm her.

The medicine man claimed his power from a vision, produced by fasting or drugs, in which he met and conversed with some animal who instructed him in the method of keeping in touch with the spirit world.

Most Indian dances and ceremonies were rituals of religious cults. In central California costuming for these affairs was elaborate, involving the lavish use of feathers and flowers (Plate XI).

War and Victory Dances

Throughout California special and elaborate public ceremonies were held for girls when they reached adolescence. There also were war and victory dances.

In 1542 Juan Rodríguez Cabrillo sailed among the channel islands and along the Santa Barbara coast, where he encountered the Chumash Indians.

These interesting natives were in many respects the most advanced in California, and among the most unusual. The Spaniards considered them superior to others in the region.

They occupied the mainland and the three northern islands of the Santa Barbara Channel. On one of these islands, San Miguel, Cabrillo died.

Their canoes were remarkable creations made of planks, fitted and lashed together and calked with asphalt. They were up to 25 feet in length and were capable of ocean navigation. Both double- and single-blade paddles were used (Plate V).

The Chumash territory, with its ideal climate and abundant food, was the most densely populated section of California. The villages consisted of large dome-shaped communal houses up to 50 feet in diameter, accommodating 40 or 50 persons.

They were built by placing the butts of a series of willow poles in a circle and bending them so that the tips were tied together at the top. Crosspieces were attached in the manner of a frame, and the whole structure was then covered with tule mats.

Chumash Housing Features

The houses were partitioned into rooms, and platform beds covered with tule mats were used. These two modern features were unique among California tribes.

The Chumash were fine basket weavers and skillful wood carvers. In addition, they made beautifully formed and polished globular pots of soapstone, often very large, as well as excellent stone carvings of animals, birds, and fish.

The earliest description of the Indians of the more northern section of California is that written by Francis Fletcher, chaplain of Sir Francis Drake's ship which landed on the coast north of San Francisco in 1579. These Indians were undoubtedly the coast Miwok.

The natives received the Englishmen with elaborate ceremonies and loud wailings. The women tore out their hair and lacerated their bodies until they were covered with blood.

Drake was crowned with an elaborate feather crown, and around his neck were placed yards of shell beads. The puzzled Englishmen did not realize that the Indians considered them to be their departed ancestors returned from the land of the dead.

Visits of explorers and buccaneers to the California coast for more than two centuries after the time of Drake were so infrequent that the life of the Indians was unaffected.

The first Franciscan mission in California was founded at San Diego in 1769.

Following this, twenty other missions were established along the coast by 1823, finally extending north of San Francisco Bay (Plate XV). The Indians were not warlike and were easily brought under the influence of the missions.

They were compelled to work at strange tasks. Discipline, to which they were unaccustomed, was rigid; refusal to work or attend church was punished. The natives were clothed, and their health and spirits began to fail. There were many attempts to escape, but there were always troops to round up the recalcitrants.

In 1834 the Mexican Government began taking over the missions, making token provision for the Indians.

By this time the Indians had lost the self-assurance that went with their own culture, but had not learned to adapt themselves to the new. They soon lost their restored belongings, their numbers began to decrease rapidly, and the mission tribes were on their way to extinction.

The gold rush in 1849 concentrated in the north and along the Sierras where the missions had not penetrated.

Gold Seekers Clashed with Indians

There was some resistance from the more warlike northern tribes such as the Modoc and the Shasta, but the opposition was short-lived (Plate IX). The lot of these tribes in the early days of the gold rush was hard. In some instances miners hunted them like wild game for sport.

Following the mining period came the amazing agricultural development of the State. As the white population increased, the Indians steadily decreased. Many tribes are now extinct; of others only a handful of survivors remains.

A few tribes in the northern part of the State and a few in the interior section of the south are still extant.

To the white man California may be a paradise gained, but to the Indian it is a paradise lost.

Notice of change of address for your National Geographic Magazine *should be received in the offices of the National Geographic Society by the first of the month to affect the following month's issue. For instance, if you desire the address changed for your April number, The Society should be notified of your new address not later than March first. Be sure to include your new postal-zone number.*

Rubber-cushioned Liberia

By Henry S. Villard*

OUT of the morning mist the African coast rose in low outline, disclosing the rocky promontory of Cape Mesurado. As we drifted nearer, the city of Monrovia took on form, giving the unmistakable impression of architecture transplanted from our Southern States.

At 8 o'clock our United States war vessel was thundering a 21-gun salute to the Negro republic of Liberia, the only fully independent Negro state on the African Continent, where only persons of African descent are eligible for citizenship.†

Our greeting was duly echoed with white-puffed accompaniment by the battery at Fort Norris. A courtesy call by the U.S.S. *Boise* was officially under way.

Our cruiser rolled at anchor in the coastal swells while port officials clambered aboard from a longboat rowed by stalwart Kru oarsmen in striped jerseys. At the stern floated the flag of Liberia, patterned on the Stars and Stripes: six red and five white stripes, with a white star against a blue background in the upper left-hand corner (Plate I).

Riding the Breakers into Monrovia

We left the ship's side in a naval launch to negotiate the breakers over the sand bar which blocks the approach to Monrovia and the Mesurado River. An exciting experience always, this landing on the African coast.

With an expert Kru pilot perched in our bow, we took the running waves at exactly the right moment. A breathless second when we seemed to drop to the ocean floor, a dash of salty spray in our faces, and we were riding serenely in the protected lagoon behind the sand bar to a welcome at the customhouse.

Future travelers to Liberia will not experience this thrill of landing through the dangerous surf. Monrovia now has a modern, man-made harbor, just completed by American contractors under a tripartite agreement with the United States Government and under the supervision of the United States Navy. The harbor is large enough to accommodate freighters and small naval craft.

Begun during the war, Monrovia's new port cost $19,000,000 in Lend-Lease funds. Liberia expects its wharf and warehouse facilities to be of tremendous value in helping to open up undeveloped but potentially rich hinterland.

Wedged between the British colony of Sierra Leone and the French Ivory Coast, a few degrees north of the Equator, Liberia occupied one of the most strategic areas on the globe during World War II (map, p. 204).

The country was not far from the British naval bases at Freetown, Sierra Leone, and Bathurst, Gambia, and athwart the route of American bombing planes which were ferried to the British forces in the Middle East.

In recognition of the ideals for which the United States fought, the Liberian Legislature, on January 27, 1944, declared war upon Germany and Japan.

War Brought Modern Airports

A modern airport was constructed above Marshall, on the bank of the Farmington River near Harbel, for the use of landplanes coming from America and as a link in the coastal airdromes of West Africa. It was named J. J. Roberts Field in honor of the first President of Liberia.

Just behind Cape Mount, on a vast natural expanse of water called Fishermans Lake, Pan American Airways established a transatlantic terminal for its Clipper seaplane service from the United States to Léopoldville, in the Belgian Congo.

When Japan attacked Pearl Harbor, all bomber and passenger traffic to the Far East was routed by way of Africa, and Liberian territory became a principal African landfall for these flights.

After the war, the U. S. Army forces pulled out of Liberia. Roberts Field, which cost $5,500,000, no longer was a scene of feverish activity. More recently it ceased to be a regular stopping place for Pan American Airways planes on their route from London and Lisbon to Léopoldville, and to Johannesburg, in South Africa. Fishermans Lake fell into complete disuse.

Liberally sprinkled with palm trees and bright flowers, tall pillars and wide verandas, the city of Monrovia with its 10,000 inhabitants suggested to our first glance a miniature Charleston or Savannah (page 206).

Along Water Street, teeming with small shops and markets, crowded with brightly dressed native women and European-clad citizens (Plates V, VI, VII, and page 205), we drove to the American Legation.

The streets were unpaved but neat. Houses in the residential quarter, closely akin in style

* The author, a Foreign Service Officer of the United States, is a former Deputy Director, Office of Near Eastern and African Affairs, United States Department of State.

† See "Land of the Free in Africa," by Harry A. McBride, National Geographic Magazine, October, 1922.

U. S. Army Air Forces, Official

"If It Please Your Honor"—a Liberian Pleader in Magistrate's Court

Such modern methods of handing down justice have not yet penetrated far into the interior, where tribal chiefs often are judge and jury. This courtroom is near Roberts Field, where Liberians came into close contact with American soldiers during World War II.

to those in the warmer sections of the United States, were laid out on well-planned city blocks overlooking the rambling native waterside district of Krutown.

Past several points of interest we rode in a preliminary tour of the city: the attractive Executive Mansion, guarded by members of the Liberian Frontier Force; the white-walled Department of State; Government Square and the Hall of Representatives, all located on the higher ground in the center of town.

From the hour the captain and officers of our vessel set foot on Liberian soil to the moment when we weighed anchor and sailed away into the quick tropical sunset, official hospitality kept everyone busy.

Prominent on the program was a visit to the Firestone rubber plantations, some 53 miles by road from Monrovia in the interior.

First we determined to have a bird's-eye glimpse of the land we had come to visit. Our Navy scouting plane took off from the heavily swelling seas with a minimum of fuss and in a moment Liberia's flat and sandy coastline was unfolding beneath a blue sky broken by gathering rain clouds.

Breakers Block Stream Mouths

The white strip of low-lying shore, 350 miles long, is relieved by three bold capes: Cape Mount, 1,000 feet high; Cape Mesurado, 260 feet; and Cape Palmas, 104 feet.

It was fascinating to watch the indentations of several rivers whose outlet to the sea was impeded by hazardous shoals and the typical sand bar we had found at Monrovia; foaming breakers and swirling currents at the mouths of these streams spelled the lack of safe harbors.

The ground within our horizon—we did not risk an overland flight—could scarcely be considered densely wooded. It rolled away in a gradual climb to an average elevation of 1,000 feet, although in the far interior, which ex-

Earl Parker Hanson

A Shot of Serum, and Mr. Porker Is Immune to Hog Cholera

Here United States agricultural specialists help Liberian farmers improve their hog-raising methods. Since 1944, a U. S. mission to Liberia, first a project of the Foreign Economic Administration and now under the State Department, has been helping that nation build up its agriculture, mining, and transportation.

tends 100 to 170 miles to an irregular boundary, there are mountains that reach more than 4,000 feet.

Liberia has an area of roughly 43,000 square miles, a bit less than that of Pennsylvania.

Wheeling over Fishermans Lake, whose protected sheet of brackish water affords the most nearly perfect seaplane base imaginable, we flew over the jutting Cape Mesurado and its nestled city of Monrovia to look down upon the rubber export center of Marshall on the Farmington River.

Then, satisfied with our quick panorama, we alighted on the sea again, ready for a motor trip to the plantations.

Along Country's Arterial Highway

We left Monrovia on a fairly narrow earth-surfaced highway which led through tropical underbrush and occasional stately palm groves toward the great American rubber enterprise which is the economic heart of the country. There was no doubt in our minds that we were in the Tropics. Though the temperature was well below 100 degrees, humidity at the end of the rainy season was still marked.

On the coast the average annual rainfall ranges from 150 to 190 inches annually, while inland the records show a variation from 85 to 100 inches. For contrast, the inhabitants look forward to the winter months when the dry harmattan wind blows in from the Sahara.

Much of Liberia is covered with brush and secondary growth. We sped on as fast as the rain-drenched surface would permit after a sudden downpour. There seemed to be no end to the number of villages. Thatch roofs and mud walls, the simplest African structure, predominated.

All along this arterial highway of Liberia, we were told, native settlements were clustered nearly within view of one another.

There the tribesmen lived in hopes that the present 65 miles of good road surface would

Drawn by Harry S. Oliver and Irvin E. Alleman

Liberia, Africa's Only Independent Negro State, Is Smaller than Pennsylvania

A century ago this Negro republic declared its independence, following establishment of a settlement there 25 years before by freed American slaves. Names like Maryland County, Washington, Monrovia, and Buchanan recall that the United States sponsored Liberia. Lying between Sierra Leone and Ivory Coast on Africa's bulge, the country has a 350-mile coastline and stretches to the border of French West Africa.

one day be extended over the rest of the trail. At intervals we encountered trucks, jammed with native laborers or supplies.

Life in a Tribal Village

Once we wandered into one of the little communities encountered at such short distances in this land of two million inhabitants. Tribal traditions and tribal authority, which grow ever more primitive the farther one journeys into the interior, were plainly enough the basis of this society, where the family group is usually polygamous.

A grizzled dark-skinned local chieftain, clad in loincloth and what might have passed for a soldier's hat, grinned and posed obligingly for his photograph.

In the door of one of the more substantial dried-mud huts, a shoeless young man, comparatively well clothed in shirt and trousers, was industriously weaving cotton cloth on a primitive hand loom.

A comely woman, bare from the waist up, carried a huge basketload on her head, an infant slung at her back, and, obviously, another one on its way.

Pigs and chickens roamed in the background. Patches of cassava and yams were

Earl Parker Hanson

He Can Repair a Torn Garment While You Wait

This outdoor tailor shop attracts customers on the main business street of Monrovia. American sewing machines have penetrated to the remotest parts of the world, including the deepest corners of the African jungle. Mandingo traders, Kru fishermen, Buzi chieftains, Bassa houseboys, and Americo-Liberians of every rank mingle in the capital's trading district.

under sketchy cultivation on the outskirts of the settlement.

We had not been an hour at the plantations before we were convinced that the entrance of the Firestone interests on the Liberian scene had contributed enormously to the equilibrium and economy of the country.

Following a wide search for conditions most suitable to the growing of rubber, unhampered by Government restrictions, the late Harvey S. Firestone found in Liberia the exact combination of climate, soil, and political stability required.

In 1926 the Firestone interests literally sowed the seeds of an independent American rubber supply by negotiating the lease of a million acres of land, at the same time concluding an agreement for a loan to the Liberian Government of $5,000,000 and the appointment of an American Financial Adviser to supervise the collection of the Government's revenue as well as its expenditures.

Today, about 27,000 native Liberians are employed on the plantations, and for them and their families Firestone has built nearly 9,000 houses. Prewar employment was about 18,000. At the height of wartime production the figure rose to 36,000.

© Firestone Tire and Rubber Co.

Monrovia Honors Liberia's Retiring President Barclay and Incoming President Tubman in an Inaugural Day Parade

© Firestone Tire and Rubber Co.

Harper, Liberia's Southernmost Port, Stretches into the Sea on Cape Palmas, an Arm of Solid Rock

A low, sandy isthmus connects the cape with the mainland. Hoffman River enters the sea to the north (upper right). Near the promontory's tip, Cape Palmas Light warns mariners from atop a white 31-foot-high conical tower. Most of Harper's 7,000 population lives on the mainland.

We were escorted on a whirlwind survey of the area by the American resident manager, who is in charge of the dual task of rubber growing and conducting the company's business relations with the Government.

On cleared ground we inspected the two types of dwellings provided for the laborers—small brick houses with tin roofs and the familiar native thatched hut (Plates XII-XIII and page 228). At last accounts the former numbered 8,017, the latter 905, while the overseer-type houses totaled 128.

For the white staff with their wives and children, numbering about 250, there were up-to-date bungalows furnished with many of the conveniences of home.

Modern Hospital for Workers

Modern medical facilities and sanitation have been provided for both tribesman and foreigner.

The story of rubber has been told too often to bear repetition here, but the sight of trees being tapped for the slow-dripping milky fluid makes the trip of constant interest to visitors (Plates X, XI, XV).*

With some 75,000 acres already planted, of which 62,514 acres were actually in production as of January 1, 1947, and with shipments approaching fifty million pounds annually, the Firestone undertaking is the biggest factor in the economy of Liberia.

Throughout Liberia, Firestone has built 200 miles of first-class earth roads.

Firestone also operates the Bank of Monrovia, sole institution of its kind in Liberia, and has organized the United States Trading Company, which does a lively commissary business not only among the white employees of the company but also among the thousands of Liberians residing on the plantations. Firestone, moreover, built Roberts Field for Pan American Airways.

Returning to Monrovia, we were forcibly reminded of the unique political structure of Liberia. Of the 28 tribes who live quietly today within its borders, from the scholarly Vais and the Mandingos of Arabic heritage to the stalwart Krus who take naturally to the sea as boatmen and deckhands on the ships that touch at the various ports of West Africa, relatively little has been published.

Tribes Cling to Old Beliefs

Basically pagan, with the exception of a scattered Mohammedan following, the bush tribes range through various shades of color, speak a variety of dialects, and adhere to beliefs they have practiced for centuries.

Their principal occupation is the cultivation of rice, corn, cotton, and such essential food products as grow most readily in the tropical climate. Some domestic animals are raised, including goats, sheep, and cattle. Pottery and basket making, weaving of cloth, and working in leather, iron, silver, and gold are the ordinary industries.

As an example of the latter, we purchased from an apprentice goldsmith in one of the wayside villages a finely wrought, though somewhat malleable, pair of cuff links made of gold taken from some near-by alluvial deposit.

Against such an elementary social background, a way of life carried over from American pre-Civil War days had been successfully superimposed by descendants of Negro colonists from the U. S. and West Indies.

Together with some 60,000 of the aborigines whom they have assimilated, the 12,000 survivors of this original American immigrant stock make up the civilized society of the coastal region and carry on the business of the country in government, in trading, and in law.

Freed Slaves Settled in Liberia

The birth of Liberia as a nation was a natural consequence of our Government's decision in the early years of the nineteenth century to prohibit the further importation of slaves. Contraband human cargoes were being seized by naval patrol vessels, and the idea developed of returning the liberated Negroes to the land of their origin.

Most of the early Negro emigrants from America who sought a new life on the shores of what is now the Republic of Liberia were freedmen sponsored by societies formed for their colonization.

Chartered vessels, after the Emancipation Proclamation, transported a large number of Negro agriculturists and small traders to the distant homeland across the waters.

The habits, customs, language, and religion of the Americo-Liberians, are, of course, utterly dissimilar from those of the aboriginal inhabitants who never left their own land.

English was their language in America, and English is the official language of Liberia.

European dress is the fashion in the coast towns they founded. English silver was the prewar medium of exchange, but today it is the American dollar.

Affiliation with some branch of the English or American churches is almost universal among the group. To a considerable extent, education is assisted by American or English foreign missionary organizations.

* See "Our Most Versatile Vegetable Product," by J. R. Hildebrand, National Geographic Magazine, February, 1940.

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Kodachrome by Charles W. Allmon

Proudly a Color Guard Escorts Liberia's Flag, Patterned after Old Glory

The national emblem heads a parade through the streets of Monrovia, the capital, at a quarterly inspection of the Liberian Army. United States Army instructors staffed its officers' training school during the war.

An Animated Haystack with Ebony Head Dances to the Throb of Drums. It Drives Away Evil Spirits

Coarse, shaggy fiber covers even the head of the bush devil inside. Hand-carved mask is held above it on a stick. Most of the tribesmen are unaware that a human being is within the bulky costume. Hinterland Liberians cling to ancient superstitions, but the men have adopted white undershirts and shorts. When the photographer came close, a chief warned him not to point a finger at the dancer. "You'll get sick," he said. "Better not go near the devils. If their breath touch you, it burn!"

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Kodachrome by Charles W. Allmon

Even Baby Is Treated to Daubs of White Clay Make-up

Use of this cheap and plentiful "cosmetic" is a beauty "must" for mother. The thatch-roof Liberian village in which they live borders a growth of rubber trees on the Firestone plantation, where baby's father works.

←

Strings of Beads and a Towel Solve Her Skirt Problem

This village schoolgirl, at 12, is of marriageable age, but before she weds, her prospective husband must pay her family the customary $40 dowry. Like most of the girls who attend native bush schools, she wears shoulder harness and a head scarf.

→

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Kodachromes by Charles W. Allmon

Tattoo Marks on Foreheads Are in the Height of Fashion

An even more stylish touch among such Gola tribe belles is to dye the scars a dark blue.

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Kodachromes by Charles W. Allmon

Gaily Dressed Are a Mandingo Chief and His Favorite Spouse

Two other wives, not so highly regarded, have less elaborate clothing. The chief wears a flowing robe, Mandingo attire for centuries. Pith helmet, with rubberized covering for the rainy season, adds to his prestige.

© National Geographic Society

Kodachrome by Charles W. Allmon

A *Gri Gri* Girl Graduate Comes by Bus to Monrovia to See the Sights

Although chaperoned by her mother (left), head wife of a clan chief, and a friend, she is timid in the "big city." In *gri gri* (fetish) bush schools girls learn tribal rituals and domestic arts.

© National Geographic Society

Selling Food in Monrovia's Market Is Women's Work

Papayas and bananas in foreground are common. Back of them lie clusters of reddish palm nuts, which yield an oil that flavors rice. "Ground peas," or peanuts, in the big pan beyond, grow widely in Liberia.

Kodachromes by Charles W. Allmon

In a Wooden Mortar a Kpelle Housewife Pounds the Family Rice

Freed from the hulls, the mixture goes into the large tray the woman on the right is holding. When she tosses the mass into the air, the chaff will blow away, and she will catch the descending grains.

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Kodachrome by Charles W. Allmon

In Monrovia's Market a Mohammedan Trader Displays a Native-woven Cotton Blanket, Colored with Natural Dyes

Hundreds of Small Beads Are Strung into a Mandingo Woman's Necklace

Her hair-do is more elaborate than is the style in most Liberian tribes, and she wears undergarments.

© National Geographic Society

Kodachromes by Charles W. Allmon

They Hope to Sell the Ivory Box to a European Visitor for $20

Two Mandingos on the rubber plantation compare the retail values of their wares. Ivory rings and bracelets are common, but during the war influx of American soldiers caused the prices of ivory objects to soar.

© National Geographic Society

Kodachrome by Charles W. Allmon

Looking for Jobs, They Start a 150-mile Bush Trek to the Rubber Plantation

A village headman sets off from home with his wife and two village boys, bound for the rubber forests 53 miles from Monrovia. Loads of the boys are heavy, for they have no wife to share them.

"Chop" Time on a Rubber Plantation—a Noonday Meal of Doughy Rice with Fish and Coffee Alongside

In addition to meaning "meal-time," "chop" also means rice, because it makes up three-fourths of the native diet. Here the wives of a rubber overseer have pounded their rice in the mortar, then cooked it in the dishpan. Once Liberia exported coffee, but today the crop is consumed locally.

Liberian women, as susceptible to the enchantment of rhythm as the men, often syncopate the blows of their clubs or pestles when they are milling rice or cassava. The tantalizing rhythm thus set up soon starts an impromptu dance in the village.

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Kodachrome by Charles W. Allmon

A Tapper Brings In Milky-white Latex by the Bucketful

The creamy fluid accumulates in a network of tiny tubes within the tree's inner bark. Tapping requires skill. If the worker's specially designed knife goes too deep into the trunk, it leaves a serious wound.

←

Skillfully He Budgrafts a Rubber Tree to Increase Yield

This operation is performed on year-old saplings. Six years later they will attain proper size for tapping.

→

© National Geographic Society

Kodachromes by Charles W. Allmon

© National Geographic Society

Firestone Rubber Gatherers Prefer Villages of Thatch-roofed Huts

Workers and their families are housed in the small circular dwellings; overseers occupy the bigger ones. Tiny huts are outdoor toilets. Women do the family washing at near-by streams but bring it back to dry in front of their doors. This is part of a village of 800. Today the company employs about 27,000 Liberian tribesmen.

Kodachrome by Charles W. Allmon

Latex from 75,000 Acres of Trees Helps Meet America's Demand

This rubber plantation in Liberia is one of the largest in the world. Its equipment is thoroughly modern, yet it is set down in a jungle land where the witch doctor and the country devil still hold the fanatic faith of many tribes. Well-kept gravel roads connect collecting stations with the huge processing factory.

© National Geographic Society

Kodachrome by Charles W. Allmon

Hurry, Hurry! Gbanga's General Store Has Just Opened a Sale of Newly Arrived Colored Calico

Cast-iron pots, knives, beads, and other bush-country necessities and luxuries are kept in stock at this store near the French West Africa border.

© National Geographic Society

Liberia Exports Part of Its Rubber as Liquid Latex

This shipment belonged to the U. S. Reconstruction Finance Corporation.

Kodachromes by Charles W. Allmon

Raw Crepe Rubber Goes to the Drying Sheds

It has been coagulated with formic acid at the processing factory.

© National Geographic Society

Kodachrome by Charles W. Allmon

Tribesmen Set Up a Hand-powered Sawmill Wherever They Find a Suitable Log

They raise the heavy timber to a crude platform, then rip off planks for bridge building or other rough construction. In the jungles, mahogany, rosewood, and other valuable trees thrive, but Liberia has not developed a lumber industry.

It would be difficult to tell much difference in appearance today between the towns of Monrovia, Marshall, Harper, or Robertsport, and similar settlements in our Deep South.

Such affairs as the weird tribal dances, which were put on for the benefit of the visitors from our ship, they regarded exactly as any other body from the civilized world would regard native practices of this kind.

Modern Appliances Reach the Bush

In turn, the Americo-Liberians have introduced the radio, the automobile, the movie, the electric light, and the refrigerator into the bush country.

Outstanding example of the civilization transplanted by the Americo-Liberians is former President Edwin J. Barclay.

In the first five minutes of a private interview Mr. Barclay revealed a grasp of international affairs that would gain respect in any chancellery of the world. His keen eyes showed that he was well aware of present-day political trends and developments; of how they may affect the future of his country.

He was educated in his Government's own Liberia College at Monrovia and knew the country intimately through frequent tours into the interior, where he enlisted the cooperation of tribal leaders in keeping peace.

His successor in office, President W. V. S. Tubman, not only has continued the progressive tendencies of Mr. Barclay but has gone even further. His sincere interest in the remote tribes has carried him deep into the interior of the country, which has meant covering many miles over rough trails, either by hammock or on foot.

In May, 1943, President Barclay, soon to retire from office, and President-elect Tubman visited the United States. They were entertained by President Franklin D. Roosevelt at the White House, and Mr. Barclay made brief addresses to the Senate and House.

They came to Washington to repay the visit made to Liberia by President Roosevelt following the historic Casablanca conference.

United States Sponsored Birth of a Nation

To understand fully what prompted the visit of our American cruiser, we must go back to the historic concern of the United States Government for the destiny of a nation which was carved out of the African wilderness by settlers from our own shores.

In Washington, D. C., 130 years ago, the American Colonization Society was formed. Its supporters included Judge Bushrod Washington, nephew of George Washington, Henry Clay, Daniel Webster, Senator John Randolph of Virginia, Francis Scott Key, and President James Monroe, for whom Monrovia was named.

With an appropriation from the United States Congress, two small schooners were fitted out to carry Negro colonists to West Africa. By 1822, under white leadership, the first permanent settlers reached the mouth of the Mesurado River.

The tribulations of the Pilgrim Fathers were paralleled in this equatorial setting. A sullen welcome awaited from the native chiefs, who saw their lucrative slave trade jeopardized. But with the help of Capt. Robert F. Stockton, who had sailed to the Mesurado under United States Government orders, a bargain was finally clinched for a suitable strip of land.

The story goes that a deed was obtained in return for a colorful and miscellaneous collection, embracing nails, iron bars, mirrors, hats, shoes, beads, umbrellas, walking sticks, knives, forks, spoons, rum, and a box of soap.

After Stockton sailed away the colonists cautiously moved to the mainland and, in the face of all cruel discouragements, began to build their homes and till the soil. The torrential rains were a terrible handicap. Fevers, illness, and death came with appalling frequency.

Liberia Becomes a Republic

"The Love of Liberty Brought Us Here," later to become the national motto, was steadily repeated by the staunch band of pioneers as they dug in to stay.

Colonization societies in New York, Pennsylvania, and Massachusetts backed other settlements along the inhospitable shore line, which presently united for mutual protection in the Commonwealth of Liberia.

Official agents of the United States Government assisted in maintaining the enterprise in its early struggles, and arms and ammunition were supplied through them for defense.

Twenty-five years after its founding, the Commonwealth had a population of 4,000 Americo-Liberians. By that time Liberia was experiencing the growing pains of statehood.

On the ground that it was not a sovereign nation and therefore had no right to enforce customs laws, the captains of trading vessels defiantly landed goods at various points on the coast and refused to pay either tariff or fines. Upon the advice of the American Colonization Society, the settlers resolved to put an end to their equivocal status and become a full-fledged independent nation.

On July 26, 1847, Liberia's Declaration of Independence was announced to the world.

Kenneth H. Meeker

Bush Devil Engineers Won't Tell How They Built This Bridge

Secret methods are handed down from father to son by these primitive tribesmen. While a bridge is being constructed, villagers living near by are forced to move, so they cannot discover how the work is done. Here three liana tendril cables, two on the sides and one on the bottom and fastened to tree trunks, span the St. John River. Woven palm fiber makes up sides and flooring. No nails are used. Ten heavily laden men can cross such a groaning, swaying bridge at one time.

Joseph Jenkins Roberts, Virginia-born boatman and barber, was elected President.

Last July the centenary of Liberia's establishment as a republic was observed throughout the nation, as well as in the United States.

On the Anson Greene Phelps Estate in New York City, a group of State Colonization Society members designed, in 1847, the Liberian flag, so closely resembling our own (Plate I). The bunting left over was carefully preserved, destined eventually to find its way also to Liberia on board an American warship.

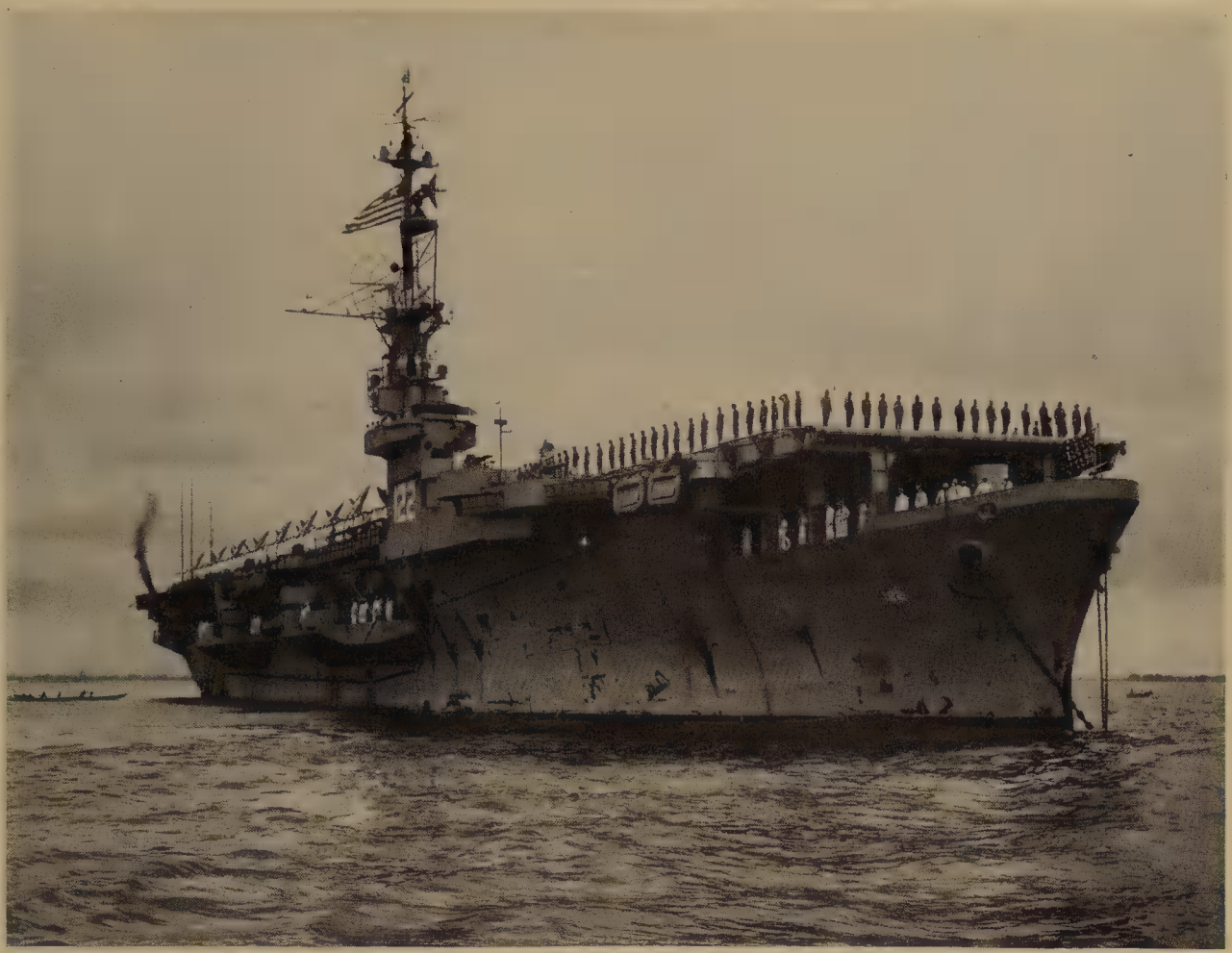
Made up as a miniature emblem and encased in an insect-and-climate-proof frame, it was entrusted to me for presentation to the Liberian Government on behalf of the trustees of the Phelps-Stokes Fund, a philanthropic organization which has displayed much solicitude for the experiment in Liberia.

During the early years of Liberia's existence, coffee and sugar cane were extensively grown for export, and the Americo-Liberians engaged in profitable trade up and down the African coast, as well as with Europe and America. But other areas, notably Brazil, presently monopolized the coffee market and economic clouds began to darken the horizon.

Liberia became entangled in concessions, promotion schemes, and deals with European interests, which brought to the still adolescent nation the unhappy experience of foreign debt, not to speak of a threatened political disaster. In its hour of need, Liberia appealed to the Government of the United States.

A commission was sent to Monrovia, resulting in the negotiation in 1912 of a loan of $1,700,000 guaranteed by American, British, German, and French bankers, with a receivership of Liberian customs revenues.

But Liberia was to reach maturity the hard way. World War I ruined the program envisaged by this joint fiscal control and once again the United States Government was asked for help.



U. S. Navy, Official

Sailors of U. S. S. *Palau* Man the Rail to Receive Liberia's President

Flying the Liberian flag, the "baby flattop" anchored outside the breakwater of Monrovia's new Lend-Lease harbor in July, 1947, to help celebrate the Republic's 100th anniversary. The harbor, completed only a few months later, is big enough to accommodate the *Palau,* but rough water might have prevented her departure on scheduled time. Great Britain and France sent cruisers for the ceremonies, and detachments from the three warships took part in the centennial parade.

A wary postwar American Senate, however, refused to approve a loan, and the Liberian Government was left in desperate financial straits, from which it succeeded in extricating itself by negotiating in 1926 a loan of $5,000,000 from the Firestone rubber interests.

Rubber Benefits a Bankrupt Nation

The benefits to Liberia under this plan were instantaneous and far-reaching. With the funds available, the Government was able to lift itself out of the financial morass into which it had wandered and to consolidate and bond all its external and internal debts.

While gold production has substantially increased and the exploitation of iron-ore resources has been begun by an American company, the economy of Liberia was nevertheless greatly affected by World War II.

Except for rubber, Liberia's chief trade was with Europe. Germany was the largest buyer of its staple products, such as piassava (a type of fiber), palm oil, palm kernels, coffee, and cacao, and German interests played a leading part in the import trade and in shipping. Now, of course, the Germans don't call there any more.

More than ever, Liberia looks toward the United States. American ships are her principal link with the world. Of the exports of Liberia in 1943, valued at $9,107,902, rubber sent to the United States accounted for $8,059,368. Imports totaled $3,984,341, all but $327,640 of which was of American origin and represented in large measure Firestone machinery and equipment. British West African silver was retired from circulation on December 7, 1942, and replaced by United States currency.

In the wartime dislocation of its trade, Liberia suffered a serious decline in customs duties. Imagine a national budget pared to $675,200 for an entire calendar year! That is what Liberia operated on in 1940. Liberian

Firestone Tire and Rubber Co.

Deep in a Cultivated Rubber Forest Nestles a Firestone Model Village

Each house is built of brick and has a small covered veranda in front. Other workers' villages have thatch-roofed huts (Plates XII-XIII). Space in center of this settlement is a recreation ground. One building houses a dispensary, in charge of a dresser trained at one of the two modern Firestone hospitals in Liberia. The superintendent of this forest, a white man, makes rigid inspections of the village water supply and other sanitation facilities. Negro workers occupy the houses rent-free; the company also pays their Federal hut tax.

officials from the President down took a salary cut to assist in the economy drive and tide the country over the emergency.

Now prospects of increased revenue have brightened through better collection of the hut taxes and additional exports of gold and rubber, so that receipts have reached about a million and a half dollars per annum. The national budget has been balanced.

What is Liberia's present relationship to the United States?

American names decorate the landscape of Liberia: Maryland County, Stockton Creek, the towns of Marshall, Buchanan, Washington, Robertsport, and Careysburg. Treaties of friendship, commerce, and navigation; of conciliation, and of air navigation, have been signed between the two countries.

The able staff of the American Legation at Monrovia, led by Minister Raphael O'Hara Lanier, is entirely composed of members of the Negro race.

As our war vessel sailed away from the tiny republic which has so successfully preserved its independence throughout the years, we felt that the United States more than ever could not forget its sense of responsibility for the welfare and integrity of Liberia.

First American Ascent of Mount St. Elias

By Maynard M. Miller

EVERYTHING was set. On the icy shoulder of the mountain we had stamped out the drop square, 50 yards on a side, in deep new snow.

The U. S. Army Air Forces support plane swept into view on its first drop run. Breathing the thin, bitter air at 13,300 feet, we watched for precious food supplies to hurtle down, rations sorely needed to fuel our tired bodies the rest of the way to the top.

Everything was going well. Above us swirling mists hid, revealed, and hid again the icy crown of Mount St. Elias, fourth highest peak in North America.* A mighty marker post on the Yukon-Alaska boundary, where Alaska's panhandle meets the "pan," the gleaming hulk of rock and ice soars 18,008 feet above the Pacific Ocean (map, page 231).

It was July 13, 1946. We had waded ashore at Icy Bay nearly a month before.

"I Felt Myself Drop"

Then it happened. Unroped, with camera in hand, I stepped back a few feet from one of the tent pits we had dug out of the snow. I wanted to get both camp and approaching aircraft into my picture.

Without warning, I felt myself drop. Instinctively, I spread my arms. By sheer luck, they held on the edges of the hole, abruptly arresting my fall.

I don't think I breathed again until a couple of the boys ran over and hauled me out.

Peering into the pit that had almost swallowed me, I couldn't see bottom. It apparently was part of a buried crevasse behind the cornice overhanging the 8,000-foot cliff in front of our Camp Ten.

Then, after I had shaken the snow from my clothes and the fright from my heart, I looked on in dismay as the silver plane plunged through patchy fog on its last run. Two big boxes of priceless food tumbled from the aircraft's belly and fell, not on the target area, but over the ice cliff, smashing to bits long before they ever hit the glacier far below.

The pilot had overshot, but it was no fault of his. The weather was rapidly "going sour" and he had to let go through the thickening "soup" or not at all.

That was the way it went. The "Saint," as we familiarly dubbed the great mountain, was ever alert to catch us off balance, as it had just caught me! Across our path it threw yawning crevasses, rumbling avalanches, and treacherous ice slicks. All these hazards we met with caution and strict safety technique.

There were eight of us, seven men and one woman, all experienced mountaineers. Through the war we had buoyed our spirits with remembrance of our compact to join forces, after the "unpleasantness," to attack this great peak.

The fruition of long planning and hard labors was now, it seemed, within our grasp. The Harvard Mountaineering Club Mount St. Elias Expedition was close to its goal.

No American had yet stood on the summit of St. Elias. Sole previous conqueror of the peak was the illustrious Italian Alpinist, the Duke of the Abruzzi, who led an expedition to the summit in 1897, by way of the northeast ridge. Our approach was by the southwest ridge, a longer and more difficult route.

Our climbing ropes held mountaineers from four corners of the United States: Andrew Kauffman of Washington, D. C., and his wife, Betty, who constituted the food committee; William Latady and William Putnam, from Cambridge and Springfield, Massachusetts, in charge of equipment and camps.

Then there were the Molenaar brothers, Dee and Cornelius ("Kay"), Los Angeles men, respectively our photographer and meteorologist; Lt. Benjamin Ferris, from the Climatic Research Laboratory, Lawrence, Massachusetts, loaned to us as Army observer and medical officer; and myself, from Seattle, Washington, as leader.

Keyed up with anticipation, our little party had flown from Juneau to Yakutat on the afternoon of June 12.

Air Forces Give Support

Through the interest of Gen. Carl Spaatz, Commanding General of the Army Air Forces, (now Air Force Chief of Staff), and Brig. Gen. Edmund C. Lynch, head of the Alaskan Air Command, the AAF's Tenth Rescue Squadron had been assigned to give us air support as a practical training exercise.

Ours was the first civilian mountaineering expedition to enjoy full-scale military aerial support throughout its progress.

* See: "Mount St. Elias, Alaska, First National Geographic Society Expedition, 1890," and "Mount St. Elias, Alaska, Second Expedition, 1891," in the *Cumulative Index to the National Geographic Magazine, 1899-1946;* also "Monarchs of Alaska," by R. H. Sargent, July, 1909, and "National Geographic Society's Alaskan Expedition of 1909," by Ralph S. Tarr and Lawrence Martin, January, 1910.

Dee Molenaar

The Trail Winds among Death-trap Crevasses. Some (Right) Are Bridged by New Snow

The men traverse slopes of Mount Haydon, heading for the 10,000-foot saddle between it and Mount St. Elias (background). The route ascended St. Elias's southwest ridge (sunlit slope, left center).

Drawn by Theodora Price and Irvin E. Alleman

Mount St. Elias Rears Its Icy Crown Where Alaska's Panhandle Meets the "Pan"

Vitus Bering, Danish navigator exploring for Russia, sighted Mount St. Elias from far at sea July 16, 1741. He was the first European to view North America's fourth highest peak, towering to 18,008 feet. The Harvard Mountaineering Club Mount St. Elias Expedition reached the summit July 16, 1946, 205th anniversary of Bering's discovery. Main map and inset show the first, second, and fourth of North America's greatest mountains: Mount McKinley (on inset), Mount Logan, in Yukon Territory close to St. Elias, and Mount St. Elias. Third-ranking summit is Mexico's 18,700-foot Citlaltepec.

Capt. Roy Holdiman of the Tenth Rescue Squadron flew his plane from Anchorage to Yakutat one afternoon. In a preview flight over our mountain objective, we arranged sites and signals for the aerial delivery at three points of a ton and a half of equipment and supplies (page 245).

Fragile items, such as radios, cans of gasoline, skis, and instruments, were to be parachuted. Food and unbreakables were stoutly packed for free-dropping (page 248).

A local boatman, Tony Novatney, agreed to take us into Icy Bay, our jump-off point for the trek to St. Elias.

With 3,000 pounds of back burden, we went ashore in a cold drizzle and waved a doleful farewell to the little craft put-putting back to civilization. We were on our own.

Army Equipment Put to Test

The Army Quartermaster Corps and the Army Air Forces had supplied us with a lavish assortment of clothing and equipment which we agreed to test. Much of the material had been designed to take advantage of lessons learned during the war, but had not yet been thoroughly tried out in the field.

In addition to a variety of alpine climbing, camping, and traveling gear, we "modeled" 11 kinds of cold-weather clothing (Plate VIII).

More than three-fourths of our route would be over ice and snow, so we would have a golden chance to study effectiveness of equipment made for Arctic and alpine use.

It proved a time-consuming exploit to move 2,000 pounds of equipment up to the final battle line under Mount St. Elias, after establishing caches for our return. Several trips were necessary between each camp to relay the stuff along. Five rough miles brought us to the Chaix Hills. From there we looked up over broken ice of the Tyndall Glacier to 11,921-foot Mount Haydon, an unclimbed summit whose slopes formed part of our route to the Saint.

Tyndall Glacier interposed a heartbreaking barrier. The direct traverse we had planned proved impossible, for the river of ice was meshed with crevasses. To circumvent these we had to take a zigzag course, traveling several miles laterally for each mile of forward progress.

To save time we cut corners, crossing narrowing crevasses by precarious snow bridges.

The glacier startled us frequently with jerky movements. Jumbled icefalls were too dangerous to set foot on; we skirted these awesome obstacles. Laden with heavy packs often weighing 80 to 100 pounds (Betty carried lighter loads, up to 55 pounds), we were working very hard, even though moving at a snail's pace.

Everybody donned dark glasses as soon as we hit the ice. When the sun shone, the thermometer in wind-free snow basins reached 85°, largely because of glaring reflection.

Desert Heat on Tyndall Glacier

An untaped nose quickly became scorched and red. If we impatiently shed shirts, severe burning was the penalty. There was a good excuse to let beards grow: if we had shaved, sunlight reflected from snow would soon have seared the undersides of our chins.

As I ran back and forth on the glacier above Camp Six taking movies of the relay party, my mouth hung open from exertion. That evening the roof of my mouth was sunburned. My tongue and lips were so sore I could hardly eat. I kept going by sipping cold tea.

Camp Seven, at the base of the main bulk of the Haydon-St. Elias massif, was a perfect spot for a "seventh-inning stretch" before tackling the upper slopes. A lovely sun-bathed meadow of heather, moss, and grasses fringed the foot of a ridge up which our route would pass.

Our name for this camp, "Shangri-la," was descriptive, if not original. Strains of a harmonica, swelling and ebbing across the lonely land, abetted Nature in lulling us to relax in an attitude of "Who cares!" Ben Ferris, stretched out on the warm grass, expressed the general sentiment: "Let's stay here for the summer. To heck with going any higher!"

Ben aroused himself sufficiently, however, to keep up the "step test" and other physiological experiments and observations which we had promised to carry out for the Harvard Fatigue Laboratory. Although the physical condition of our party improved all the way up St. Elias, at our highest camp none of us could complete the step test, because of the oxygen lack three miles above sea level.

This test required each man to step up on a 20-inch box once every two seconds for five minutes, to permit a check on pulse and respiration changes at different altitudes.

On a snow slope near Camp Seven the Tenth Rescue Squadron made the first drop of supplies on June 27, exactly on schedule. It was a joy to see the big DC-3 swoop in at 200 feet and dump more than half a ton of goods squarely within the target area.

But the plane's visit reminded us that we still had 15,000 feet of mountain to scale and that our next rendezvous with Captain Holdiman and his crew was only a few days off.

While some of us completed relaying supplies from Camp Six to Camp Seven, we sent out an advance crew to dig in the next two camps and prepare for the aircraft's return.

Advance Party Scouts Route

Putnam, Latady, and I each took 60 pounds and started up on June 29. Rotten rock slowed our pace on the first ridge, but by sundown we had reached a shelf of shale at 7,500 feet, ideal for a campsite.

Next morning dawned crystal clear. Looking ahead up the chosen route, we saw the glaciated rim of a huge cirque, or ice-floored mountain amphitheater, curving away for miles towards the summit of Mount Haydon. Below the rim lay a great snowy basin.

From Camp Seven the others began to bring up the first relay loads. Latady, Putnam, and I set out to pioneer farther along the avalanche-swept cliffs that walled the cirque (page 245).

Crossing a steep narrow gulley, we became aware of a terrifying sound—at first a distant rumble and quickly a swelling swish—of sliding tons of snow, plunging at us with ever-swifter speed.

But this avalanche was not for us. It thundered past, its powdery fringe burying our feet and ankles. We stood silent for a minute, watching the white swirl of destruction wear itself out on the ice flats below. Too close!

Up we crept over slopes of scree and along cliffs of ice and rock. We plodded through knee-deep snow soggy from the blazing sun. We chopped steps in ice cliffs, leaving safety ropes fixed for future use.

Finally we emerged dramatically through a hole in an overhanging cornice upon the hard-packed upper ridge of Mount Haydon. Near by, at 10,400 feet, we established Camp Nine and crawled into sleeping bags to await the scheduled arrival of the plane in the morning.

Stormbound for a Week

At seven we were awakened by the soft, dispiriting patter of powder snow on the tent wall. The square we had tramped out as aiming spot for the air delivery was completely erased. A strong southeast wind filled the air with blowing snow. We knew the plane would not arrive that day.

We could not have anticipated what came

Kodachrome by Cornelius Molenaar

Conquerors of Mount St. Elias Stand on the Highest Point of Our International Boundary

Maynard M. Miller, leader of the expedition which made the second ascent of North America's fourth highest peak (18,008 feet elevation), holds the United States flag. Dee Molenaar extends the Canadian emblem. Before them is Alaska; behind them Yukon Territory. Four members of the victorious party were former presidents of the Harvard Mountaineering Club, whose banner (Plate II) flies between the flags. Clouds mask the landscape below 12,000 feet. The Italian explorer, the Duke of the Abruzzi, attained this spot in 1897.

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Kodachrome by Maynard M. Miller

Near the Top, Climbers Struggle up an Almost Vertical Pitch

At 17,500 feet, William Latady (left), with rope anchored to his ice ax thrust deep in snow, pulls in the free cord as Dee Molenaar mounts steps chopped in ice. Downhill loom white buttresses their toilsome route ascended.

© National Geographic Society

Kodachrome by Andrew J. Kauffman

From a Nest of Nylon Blizzard Tents a Climber Eyes the Distant Icy Goal

Still half a mile above at upper left soars the crest of Mount St. Elias, which rises higher directly from sea level than any other mountain on earth. From 15,500-foot Camp Eleven the route leads up the ridge in center

Kodachrome by Maynard M. Miller

As Clouds Roll Away, Bill Putnam Searches the Sky for the Plane Due to Drop Supplies

Three of the party were stormbound for a week in this tiny tent at 10,400 feet on the high west ridge of Mount Haydon. Mist veils the summit of St. Elias, known to the Indians as "Yahtsé-tah-shah" and by the climbers familiarly called the "Saint." The jumbled ice mass at left feeds mighty Tyndall Glacier.

© National Geographic Society

Kodachrome by Cornelius Molenaar

"Colossal Enterprises, Inc." Builds a Snowhouse and Windbreak on Haydon Ridge

Putnam (wearing hat) and Lt. Benjamin Ferris (placing snow block) founded the "corporation" to do necessary building. Beyond William Latady lies Icy Bay, expedition "beachhead."

© National Geographic Society

Like Stunned Scouts Back from a Lost World, Weary Climbers Toil up the "White Saint"

Backed by boiling storm clouds, Dee and Cornelius Molenaar plod up to Camp Ten, at 13,300 feet on St. Elias. They have come back from placing a safety rope on a steep ice pitch to help relay loads from below.

Kodachrome by Maynard M. Miller

Razor-backed Mount Haydon, Previously Unclimbed, Served as a Steppingstone to St. Elias

The route to Mount Haydon's 11,921-foot summit followed the shoulder and ridge on the right. On the sunlit slope (right) a great snow mass, resembling white lava, settled under the climbers with an ominous crunch.

© National Geographic Society

Kodachrome by Maynard M. Miller

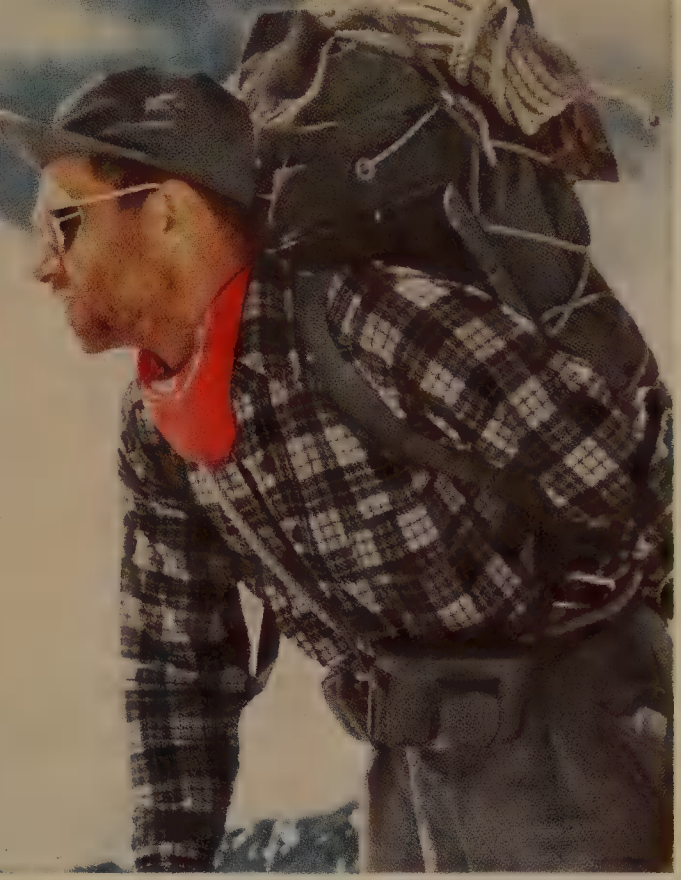
An "Egg" Drops from the Support Plane. It Fell with Others Squarely in the Area Stamped Out to Receive the "Manna from Heaven"

Black dots in the snow at 10,400 feet elevation are packages of food, gasoline, and instruments released on previous runs. In all, 27 bundles landed safely in this delivery, one of three made by the USAAF's Tenth Rescue Squadron in backing up the Harvard Mountaineering Club Mount St. Elias Expedition.

© National Geographic Society

Kodachrome by Dee Molenaar

Atop Mount Haydon Is a Featureless Face with Icy Whiskers. Mrs. Kauffman and Two Companions Pause on the Natural Figurehead



Kodachrome by Maynard M. Miller

Kodachrome by Cornelius Molenaar

Safe and Successful Mountaineering Calls for the Right Equipment, from Head to Foot

William Latady wears sunglasses to prevent snow blindness. His nylon climbing rope and plywood packboard were among items tested by this expedition for the Army. In the rope belay (right), line is fed out around the implanted ice ax as the man ahead moves over a danger spot. If he slipped, the rope would check his fall.

© National Geographic Society

Kodachrome by Maynard M. Miller

Spectacular Peaks Inspire Sketching at a Lofty Camp

Dee Molenaar takes time off to record their rugged grandeur. He sits in a nest of pack frames, emergency radio, and ropes. At his back are orange strips of cloth which helped climbers find plane-dropped packages.

to pass. For seven precious, irretrievable days a howling storm marooned the three of us in the tiny mountain tent. Several times we heard the aircraft circling above, trying to break through the shroud of driving mist and snow. But the storm kept us well hidden.

We played cards and guessing games. We ran "Twenty Questions" into the ground. We slept, we watched the weather, we fumbled in our packs for the harmonica that wasn't there.

Building a Snowhouse

With time to kill, Colossal Enterprises, Inc., built a snowhouse (Plate III).

My bedmate was a set of batteries. We had a "handie-talkie" which had fizzled as voice contact with the plane at Camp Seven. I hoped warming the batteries would make the radio work. It didn't.

The skies were swept blue on the morning of July 8 (Plate III). It was still early when we heard the distant monotone of the DC-3. An hour later we had picked up 27 bundles from squarely within our newly tramped drop space—a magnificent job of precision "bombing" (Plate VI and page 248).

July 11 found us all reunited at Camp Nine. Before pushing on across the saddle linking Mount Haydon to the upper pyramid of St. Elias, we detoured to the summit of Haydon (Plate VII). It was an unclimbed peak and we could not pass up a first ascent!

From the slopes of Haydon, as from Camp Nine, we looked across three miles of space to the appalling west face of the Saint. A brutal wall of almost perpendicular black cliffs and icefalls glittering white and blue-green, it was raked almost constantly by terrific avalanches. During daylight and evening hours our ears seldom were free of their thunder.

From miles away we watched blocks of ice, some big as houses, shatter into splinters as they bounced down the cliff.

Snow avalanches increased to a wild crescendo late in the afternoon on melting, sunny days. Ice slides from hanging glaciers, on the other hand, reached a climax of frequency twice a day, once each morning just after the sun hit the slopes and again in the evening when chilling shadows crept across the cliffs.

Since our route strictly avoided areas of bergschrund, sérac, and icefall, snow avalanches were our constant dread. We quickly learned that daytime travel was close to suicidal.

On the high slopes, therefore, we would leave camp at about 9 or 10 o'clock and climb until sunrise. Then the snow surface was frozen and the firmer footing made for much easier walking. In early July, at this latitude, there was sunshine much of the night and always light enough to move by as long as it was clear.

Climbing Mount Haydon we had a fright. About halfway up a great smooth slope we felt the whole mass of snow beneath our feet suddenly settle with a crunch that set our spines tingling. A few feet above the lead man a thin line of cleavage appeared, running horizontally across the steeper section ahead.

We stopped, feeling infinitely small and helpless. The snow mass we stood on seemed poised for flight and might easily carry all of us off the mountain to destruction on the glacier 6,000 feet down.

Gingerly but hurriedly we descended to a solid ledge and found another route to the top.

We had spotted from afar the logical site for our Camp Ten, on a prominent ice ledge at 13,300 feet on the great southwest ridge of Mount St. Elias proper.

To reach this station we climbed at night over difficult rock and ice. One 1,500-foot slope of naked blue ice demanded the utmost caution and required 400 feet of fixed safety rope (Plates IV and V).

Crampons (sets of steel frames studded with two-inch spikes that fasten on over climbing boots) were an absolute necessity. Thus shod, with ice ax in hand and properly roped, one can ascend ice slopes as steep as 80° (90° is vertical).

In climbing with crampons we were mighty careful to make sure that *all* the steel points were well imbedded in the ice surface. If you once slip on glare ice, it is virtually impossible to stop yourself. Even if roped, you may get well bruised and scratched.

For a Quick Stop, the "Self-arrest"

We followed standard practice of putting three men on the 120-foot nylon ropes. After waist loops and knots were made, this left 55 feet between climbers. The only purpose of the rope, of course, is to ensure that, if one man slips and falls, his firmly belayed companions can stop and hold him.

Had we slipped on steep icy slopes, we were prepared to throw ourselves immediately into the position of "self-arrest." You turn flat on your stomach, dig in the toes, and brace the ice ax along the side of your body with the pick point close to the shoulder dragging in snow or ice.

Crossing the blue ice mentioned above, Putnam and Ferris were chopping out steps slantwise upward and across the slippery rise.

Bradford Washburn

Trail to the Summit Is Traced on a Photograph That Helped the Climbers Plan Their Route

Before departure from the United States, the way to the top was sketched out on aerial pictures, including this view, taken by Bradford Washburn on the Harvard University-National Geographic Society Alaskan Expedition of 1938. Airplane drops of supplies and equipment were made at Camps Seven, Nine, and Ten. The route line is broken where the trail passed behind the peak of Mount Haydon.

Putnam skidded suddenly and slid away down the steep face.

Ferris had taken a secure body belay and held Putnam safely. But the rope jerked tight across Ferris's body. The taut cord ripped his fine camera from its strap and sent it tumbling down the mountain.

At Camp Ten Captain Holdiman and his crew made the drop described at the beginning of the story.

After I had been pulled from the crevasse, and when we had resigned ourselves to the loss of four days' supply of priceless food, we enjoyed a pleasant surprise.

We opened one of the dropped boxes, half expecting to find cosmic-ray equipment which had been left in the United States.

Imagine our delight at unwrapping four large and luscious apple pies, sent with the compliments of the Yakutat Bakery! (Page 247.) Each of us gobbled up a half pie in jigtime.

This unexpected treat could not have arrived at a more opportune moment. Then there was mail from home which fired everyone with new enthusiasm. My accident and the food loss were quickly forgotten.

We were all doing chores around camp when I looked over to where Bill Latady was sitting on an air mattress. He was barelegged and his feet were a gory red!

"Doc" Ferris, apparently sure at last of a patient, rushed over to see how in the world Latady had cut both his feet so badly. Bill just grinned and held up a pair of bright-red wool socks he'd been wearing.

The bloody-looking dye had come off on his feet, which he had undressed for a stretch and an airing!

Determined to press on toward the summit before another storm blew in and caught us short of supplies, we pushed ahead through waist-deep snow and along a fogbound ridge to locate our last and highest bivouac, Camp Eleven, at 15,500 feet elevation (Plate II).

Would the Weather Hold?

At our high camps, to which we had neither time nor strength to relay heavy loads, the chef might serve up the following for dinner: pea soup (from dried preparation), K-ration pork or dried shredded beef mixed with cheese and rice, dried sweet potato, and plenty of dried raisins, apricots, and apples.

To drink there was always tea stiff with sugar, as well as a choice of powdered milk, lemon juice, and hot chocolate.

With only two more full days' food remaining, the weather held our fate in its unpredictable hands. If we failed to get the break of clear skies within the next 48 hours, we should have to drop down to a lower camp for reinforcements.

If that happened, who could say if we'd ever get back up?

On the morning of the 15th, although clouds hid the top thousand feet of St. Elias and a sharp wind was blowing, we decided to try for the summit.

Two of our little company were still below at Camp Ten. We started out in two ropes of three men each. Not ten yards from camp, Kauffman, who had led off, let out a shout and nearly vanished into a gaping hole.

The frightening "who-oosh!" as the drift-camouflaged snow bridge he was crossing collapsed made us instinctively grab his rope and hoist him up to safety. The Saint was waging its war of nerves right up to the bitter end!

Mists Force a Retreat

During the excitement driving mists had closed in on all sides. We retired in defeat to the tents. Half an hour later snow began to fall thickly.

Toward evening a shout announced the arrival of Putnam and Ferris from below. The packs on their backs contained—bless them!—a little extra food and gasoline for the camp stoves. If storm and circumstance demanded, we now could stretch our rations to three days.

The morning of the 16th was biting cold, and the top of the mountain stood sharp-etched against a deep-blue sky. Wisps of blowing snow trailed off southward from the peak. That meant the north wind, the good-weather wind, was blowing!

"Kauff! Betty! Look at this!" I shouted gleefully, and my tentmates peered out to squint and grin at the bright day.

Our exclamations woke those in the other tents.

"Let's get out of here while we've got the breaks," someone cried.

By 7:30 we were roped and ready for the start. Each man carried a 30-pound pack of extra clothing and emergency equipment.

In contrast to the blue above, a tumultuous layer of clouds formed a churning floor below with icy peaks poking through here and there.

Working across the crevassed snow of the ledge and mounting a wall of rock, we topped the ridge itself. The full force of the wind was invisible ice. The route ascended steeply over sound rock. For a stretch there was little snow.

Above 16,500 feet the altitude began to tell. Wind, whipping powder snow, and the constant searching for secure handholds on rock faces proved more and more exhausting.

Merging East and West Arms of Guyot Glacier Suggest a Woolly Pair of "Long Handles"

The Guyot Glacier meets the dirt-blackened Tyndall Glacier in the distance at right. The black line (right foreground) is a medial moraine, composed of rock and dirt scraped from mountain walls.

Icy Bay, just off the picture to the right, receives both ice rivers' majestic outpourings—thousands of tons of ice a day. The Harvard Mountaineering Club Mount St. Elias Expedition landed on the south side of the bay.

The party's route to the base of the peak skirted the Chaix Hills (upper right, partly hidden by clouds); then followed the Tyndall Glacier (background) eastward (left) beyond the area of the photograph.

After conquering St. Elias, Maynard Miller and William Latady continued glacial studies in this region and southward along the Alaskan coast. Their observations revealed that, since 1888, the Guyot and Tyndall Glaciers had receded 15 miles and, in some sections, had thinned vertically several thousand feet through melting.

U. S. Army Air Forces, Official

From a Cliff-hemmed "Lake" of Ice Tumbles a Frozen Niagara

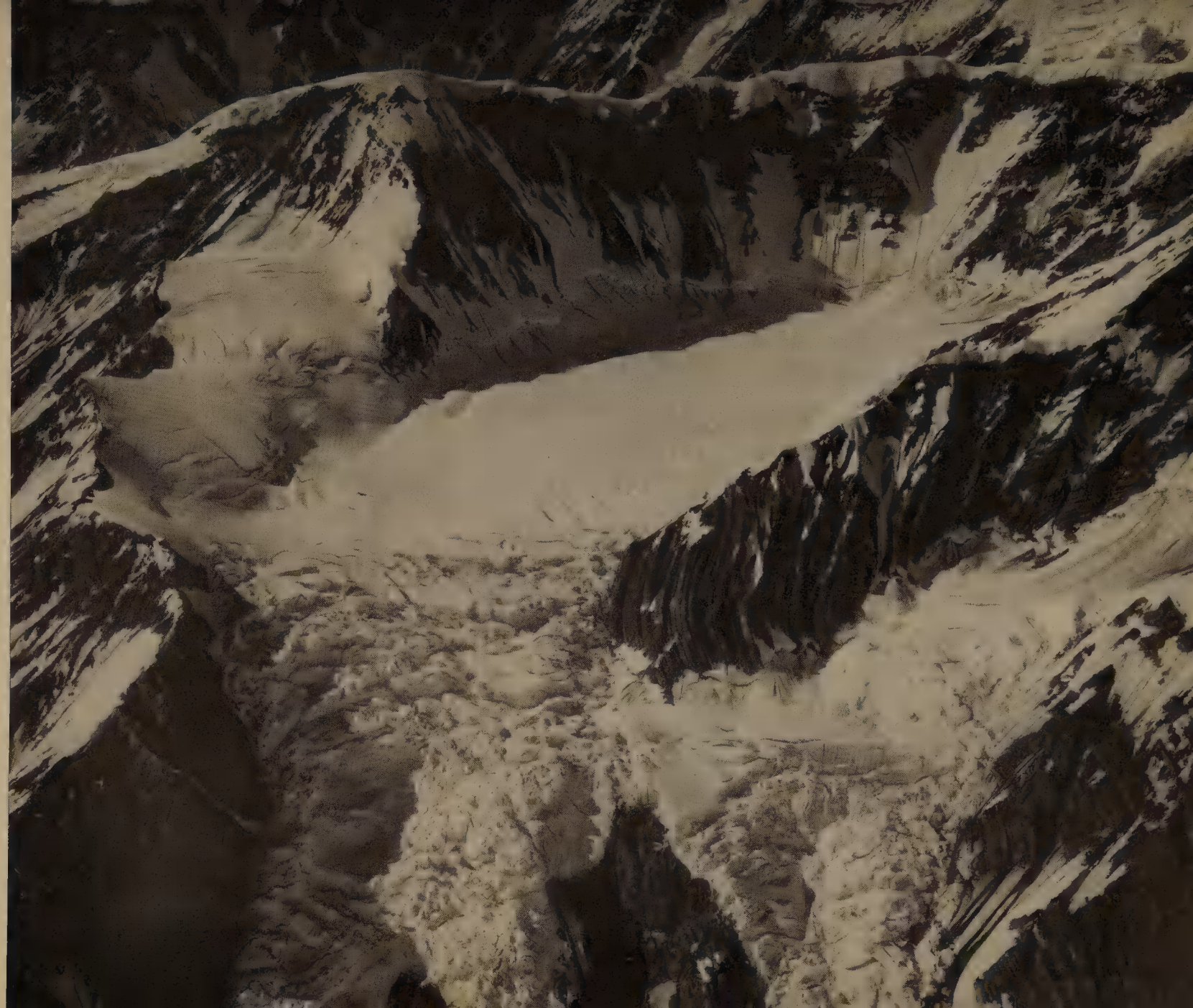
To mountaineers and geologists such alpine bowls are known as cirques. This one, three miles long, lies under the north shoulder of Mount Haydon.

The climbers' path circling the ice basin described the top of a question mark. Entering the area by the ridge at lower left, the route skirted the icefall, mounting to the snow-capped dome in left middle ground; swinging to the right atop the white-crested cliffs behind the cirque, it led out of the scene (upper right) to slopes of Mount Haydon.

This view was photographed on the reconnaissance flight, when members of the climbing party planned with the pilot of the Tenth Rescue Squadron support plane where and when equipment and food drops were to be made (page 231).

Avalanches frequently rumble down the cliffs of black rock. When they strike the cirque floor they send up towering plumes of powdery snow. Early explorers, far off at sea, mistook the snow clouds for steam from a volcano.

U. S. Army Air Forces, Official



Maynard M. Miller

To Save Fuel, the Melt Tarp Was Spread to Convert Snow to Water

Melting snow over gasoline tent stoves consumed tightly rationed fuel. Mrs. Andrew Kauffman watches precious water trickle into a pail. The black nylon tarpaulin was slung on stakes and drained by a low corner. Chunks of snow spread on the sheet melted as dark material absorbed the sun's heat.

We had to change leaders every hundred yards or so.

Dee Molenaar tapped me on the shoulder and pointed back along our trail. A lone figure was walking slowly across the ledge toward camp.

It was Bill Putnam, who had a shrapnel-wounded lung, picked up in action with the mountain troops in Italy. He and the rest of us had known the thin air high up might stop him, but the knowledge didn't lessen our disappointment that he couldn't participate in the homestretch of our race.

"How Much Longer?"

Soon we passed beneath a series of huge, mean-looking feathered snow and ice hummocks. Upward led the trail over humps, across snow faces, and through gullies.

We struggled on, from terrace to terrace, chopping, floundering, climbing.

It was getting late, and the question no one dared frame in words hammered more and more insistently in our minds: "How much longer?"

Suddenly the rope ahead of me pulled straight. From beyond an ice hummock I heard Dee Molenaar's voice, shrill with excitement. "Give me five more feet of slack and I'll be on top!"

His familiar yodel warbled out on the crisp air, and I knew we had won!

As the rest of the party plodded up and joined us on the summit, I looked at my watch. It was ten minutes to five. We dropped our packs and shook hands.

Fatigue, headaches, pounding hearts, all were forgotten in the overwhelming feeling of exultation. We had made it! We were on top!

The summit plain was half the size of a football field. We all moved over to a tiny rise that was the very highest point.

Dee beat Andy Kauffman to the draw, reaching over and planting a big kiss on Betty's cheek.

By conquering St. Elias this courageous girl had climbed higher than any other woman up to that time in Alaska and Canada.

After our first elation had somewhat subsided, we gazed out over the whole awe-inspiring array of St. Elias Mountains' major peaks, thrusting up through the sea of clouds.

To the northeast lifted the enormous bulk of a mountain even taller than our 18,008-

Maynard M. Miller

Beards and Dark Glasses Disguise Mountaineers as Ascetics Deep in Contemplation

Latady (left) and Putnam enjoy their first good meal of air-dropped supplies after a stormbound week on short rations at Camp Nine (page 241). The large can in foreground contains emergency rations for two men for ten days. Latady lounges in felt boot liners. Mess kit (center) sits on camp stove. A sleeping bag has been thrown over the tent to air. Guy ropes were firmly lashed to pegs frozen in the snow.

Maynard M. Miller

Dee Molenaar

Out of the Sky Fell Fresh-baked Pies, but Milk Came Only in Powdered Form

An airplane dropped apple pies from the Yakutat Bakery (page 243). Betty Kauffman mixes dried milk.

U. S. Army Air Forces, Official

Parachute and Load Throw Shadows on Snow Cratered by Packages Already Dropped

Equipment that would break or crush was parachuted; other items were dropped free. An aiming point (left) centers the delivery area at Camp Nine (page 241). Message stamped in the snow at right read, "Drop 3 Yellow at Upper Ledge," requesting delivery of three boxes of emergency rations at the next agreed spot. Packages for each place were painted a different color.

foot pinnacle—Mount Logan, second highest, after Mount McKinley, of all North American peaks.

Mount Logan, towering to 19,850 feet, was discovered by the First National Geographic Society Mount St. Elias Expedition of 1890, and named for Sir William E. Logan, founder of the Geological Survey of Canada.*

Flags Fly from the Summit

We stood on the international boundary between Alaska and Canada's Yukon Territory. We unfurled American and Canadian flags, donated by the Arctic Institute of North America. As they waved proudly in the wind, we fumbled with numb fingers to photograph the scene (Plate I).

To mark our achievement, at least until the next screaming blizzard, we hung on a jeep aerial the crimson banner of the Harvard Mountaineering Club.

Not until three weeks later, when we were all safely back to civilization, did we learn of an amazing coincidence.

That perfect day we had stood on the mountaintop was July 16, 205th anniversary of the day Vitus Bering's party first saw Alaska, sighted the white peak from 140 miles at sea, and named it for the patron saint of that day, St. Elias.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "Conquest of Mount Logan," by H. F. Lambart, June, 1926; "Over the Roof of Our Continent" (Mount McKinley), by Bradford Washburn, July, 1938; and "Fit to Fight Anywhere" (Quartermaster Corps Expedition to Mount McKinley), by Frederick Simpich, August, 1943.

Our Air Age Speeds Ahead

By F. Barrows Colton

PROTESTS arose not long ago when the manager of National Airport at Washington, D. C., installed parking meters around the traffic circle in front of the main building, where people drive up to put friends on planes or make brief visits.

"I had to do it," explained the manager. "Why, people were coming over here and parking their cars for three or four days while they went to Europe!"

That shows, as well as anything, how commonplace air travel has become, how completely the Air Age has arrived.

This age of flight, in which the human race is conquering the great overhead ocean of air, earth's last frontier, is developing as fast as scientific research and available funds will permit.

Man is learning to live, travel, even earn a living, and if necessary defend himself far up in what some flyers call the "New Sea," where Nature never intended he should go.*

Today a plane exists that is designed to carry its pilot to the breath-taking altitude of 80,000 feet, 15 miles, well beyond the height reached by the National Geographic Society-U. S. Army Air Corps stratosphere balloon *Explorer II,* which now holds the altitude record for human flight.†

That sky-climber is the rocket-propelled experimental Air Force plane the XS-1, built to fly 1,700 miles per hour, more than twice the velocity of sound.

Babies Born in Flight

Whether or not you ever ride in airplanes, aviation is fast changing the world you used to know. Several babies already have been born in planes in flight!

Some New York businessmen, living in outlying suburbs, now get to work in 15 minutes by air instead of in over an hour by train, subway, or ferry. Their only complaint is lack of time to finish reading the morning paper!

Every minute of every day there are approximately 100 tons of mail in the air over the United States.

There are now helicopter mail deliveries and taxi service. Airplanes are used in counting wild ducks and game, in spotting poachers, who sometimes use planes themselves, and in reseeding denuded western lands.

Prisoners, deportees, migrant laborers, seasonal fruits and vegetables are now carried by air. Planes are used to tow advertising signs, patrol pipe lines, shoot coyotes, and spray bodies of water to keep down mosquitoes.

Topographic surveys for extension of Pennsylvania's great high-speed auto turnpike from Harrisburg to Philadelphia are being made with aerial photographs. It is estimated that various U. S. military and civil agencies alone have photographed 18 to 19 million square miles of the earth's surface from the air, one third of the total land area.

Bad weather, the old bugaboo of aviation, is being conquered. Most of the leading airports of this country soon will have equipment for enabling passenger-carrying planes to land under conditions that previously would have halted all flying.

There used to be a rueful parody on the famous Air Corps song, "Nothing can stop the Army Air Corps (ex-cept the wea-ther)!" But that's no longer true. Almost daily for a year and a half, pilots of the Air Force's All-Weather Flying Project have flown the 750-mile round trip from their base at Wilmington, Ohio, to Andrews Field near Washington, D. C., without ever seeing outside the cockpit.

They have flown in all kinds of weather. When it was clear, special opaque windshields and goggles kept them from seeing outside. Every flight, including take-offs and landings, was made entirely with the aid of instruments.

A Seattle inventor has developed a one-seater helicopter, a sort of aerial motorcycle, which weighs only 125 pounds, has a speed of 90 miles per hour, and a cruising range of 200 miles.

Other inventors have developed combination automobile-airplanes (page 258). One is called the "airphibian." You fly it to the airport of your destination, land, take off the wings, tail, and propeller, leave them at the field, and drive the fuselage into town like any car.

Radar Devices Warn of Danger

Radar devices that penetrate fog and darkness to warn of ground below or mountains ahead are rapidly coming into use on commercial airliners and soon will be required.

Scientists now foresee the time when, flying in a plane powered by the lightning-fast ramjet engine, you may leave New York at noon eastern standard time and reach San Francisco *before* noon, at 11:00 a. m. Pacific time!

* See "New Frontier in the Sky," by F. Barrows Colton, National Geographic Magazine, September, 1946.

† See "Man's Farthest Aloft," by Capt. Albert W. Stevens, National Geographic Magazine, January, 1936.

N. Y. Herald Tribune-Kavallines

In Today's Air Age an Old Familiar Sign Has New Wording—"Airplane Crossing"!

"Stop—Look—Listen" warnings were posted at La Guardia Field, New York, where a highway crossed an airplane runway as a safeguard against collision until the crossing could be eliminated.

Only 22 years ago, when Rear Admiral (then Lieutenant Commander) Richard E. Byrd first flew an airplane over the North Pole, he was awarded the Hubbard Medal of the National Geographic Society.*

Today U. S. Air Force men fly over the North Pole three times a week. They have reported finding three north magnetic poles instead of one. Only recently the Air Force announced that it is ready and able to fly "anywhere, any time" in the Arctic.

Some 75,000 Americans today, including many farmers, own their own personal airplanes for use in pleasure, business, or both. Private airplanes may increase to a total of 400,000 by the 1950's, says T. P. Wright, head of the Civil Aeronautics Administration, if someone develops a safe, reasonably priced light plane which will be really useful to its owner.

Just seven years ago, in 1940, I wrote an article on aviation much of which today already seems almost as out-of-date as the horse and buggy.† Then it took 18 hours or more to fly from coast to coast. Only a few airliners had more than two engines and most cruised at no more than 180 miles per hour. Today most long-distance transport planes have four engines, an average cruising speed of 300 miles per hour, and can cross the continent in about 10 hours.

Seven years ago the fastest U. S. fighter planes still in the experimental stage did not fly more than 400 miles per hour. Now the new jet-propelled fighters zip through the sky at 600 or better, and unpiloted jet-driven craft have actually flown far beyond the speed of sound at 1,500 miles per hour.

Flying as Fast as a Bullet

Flying at 650 miles per hour to set a new world speed record, the Navy's experimental jet plane, the Skystreak, traveled at approximately the speed of a 45-caliber pistol bullet, or as fast as the earth turns at the latitude of London, England, or Winnipeg, Canada. Flying west at such a speed and in that latitude, the Skystreak would keep up with the sun and fly around the world in a day if it could carry enough fuel.

Scientists are now attacking the problem of using atomic energy for aircraft.

* See, in the National Geographic Magazine, for September, 1926, "First Flight to the North Pole," by Lt. Comdr. Richard E. Byrd, and "Commander Byrd Receives the Hubbard Gold Medal."

† See "Aviation in Commerce and Defense," by F. Barrows Colton, National Geographic Magazine, December, 1940.

Piasecki Helicopter

Hovering over the Sea, This Navy Helicopter Could Rescue a Boatload of Men

Five men climb a 40-foot rope ladder to show how large groups might be saved from life rafts, sinking ships, or forest fires. This craft can carry eight passengers and a crew of two. Its twin rotors, mounted at either end, provide powerful lift and help balance the ship (page 265).

U. S. Air Force, Official

"Right on the Beam" a Plane Comes in "Blind" over the Radio Set That Guides It

With the pilot unable to see outside the cockpit, to simulate landing in foggy weather, this Air Force All-Weather Flight project plane is being brought to earth with the aid of the radio transmitting truck in the foreground. Blind landings are made with the help of two systems, sometimes in combination. One is Ground Controlled Approach (GCA) in which a ground operator sees the plane in the air by radar and gives the pilot landing directions by radiotelephone. The other, shown here, is an Instrument Landing System (ILS) in which the pilot follows a radio beam "glide path" down to the field (pages 249, 254, and below).

Carrying cargo by air in 1940 still was definitely a sideline, compared to airline passenger traffic. But experts predict the time is coming when the airlines, like the railroads, will derive more income from carrying cargo than passengers.

In 1940 we were just beginning to explore the upper depths of the "New Sea," the vast ocean of air in which aircraft operate. Today's new big bombers are built to fly at 40,000 feet, and V-2 rockets, soaring to more than 100 miles, have for all practical purposes penetrated beyond the atmosphere, for even far below that height the air is so thin that it is equivalent to a high vacuum (page 269). The Navy's Neptune rocket is designed to climb to 235 miles.

Already a course in rocket navigation is being taught by an astronomer at the University of California. Thus aviation has begun to think about leaving the earth behind and venturing out into the astronomer's world of outer space.

Real progress is being made now in overcoming the problem of bad weather, the greatest handicap to safe and regular operation of commercial airlines.

Not long ago two planes of different lines, approaching San Antonio, Texas, found the field covered by clouds hanging too low to permit a safe landing under normal procedure.

One plane, after futilely circling the field, had to land at Houston, many miles away.

The second, however, made a safe landing at San Antonio on schedule. It was equipped with radio receivers enabling the pilot to make use of the U. S. Government's Instrument Landing System (ILS), now being installed

Staff Photographer John E. Fletcher

Berths Are Made Up Pullman Style on ▪ Transatlantic "Flying Sleeper"

In the lower a mother prepares for the night while her son waits for his bed to be made ready. This Pan American World Airways Constellation has 12 berths, each large enough for two persons, plus 16 seats for "sit-up" passengers. It can seat 40 when berths are not in use. The New York-to-London flight takes 14 hours (page 259).

Ross-Pix

On Moving Day Now, You Can Fly Your Furniture

Household furnishings are packed in a cargo plane, equipped as a flying moving van, for transport from Newark, New Jersey, to Los Angeles. Carrying freight by air is a growing business all over the world. Cargoes range from young elephants, race horses, and pedigreed cattle to sea food, cosmetics, cut flowers, and bank checks. All airlines carry freight as well as passengers, and some operate special cargo planes.

at all major American commercial airfields.

To use ILS a pilot coming to a fog-covered field lines up his course with the aid of a runway localizer, radio signals that show him that he is headed toward the invisible runway below. Then he flies down a radio beam "glide path," which guides him unerringly to the end of the runway where he can land.

Automatic Landings Foreseen

Eleven commercial airlines now have equipped their planes with ILS receivers, and others are following suit. So equipped, they are permitted to land under conditions of lower ceilings and less visibility than otherwise would be allowed. As they gain experience with ILS, they will be authorized to land with its help under increasingly difficult conditions.

ILS has been adopted for use all over the world at commercial airports by the International Civil Aviation Organization (ICAO).

Next step after ILS will be "automatic landing," a combination of ILS with the plane's automatic pilot device, which will bring a plane safely and accurately down to earth under conditions of only a 25- or 30-foot ceiling and zero visibility. Its workability already has been proved by the U. S. Air Force's "push-button flight" project with which an experimental plane already has "flown itself" across the Atlantic to England and back with the crew merely sitting by.

Another "blind landing" system, now in use by the United States Air Force and under test by the Civil Aeronautics Administration, is Ground Controlled Approach (GCA), which is operated by radar and radio. A radar beam, sweeping an area of 30 miles' radius around an airport, shows on the radarscope the location of all aircraft within that area.

The GCA operator, watching his scope,

Ross-Pix

That Distant Lake Where the Fish Are Biting Is Easy to Reach by Air

Assembling the collapsible canoe brought with them in their own plane, this couple prepares for a day's fishing far from home. Equipped with pontoons, light planes can use a body of water for landing.

gives instructions to the planes by radiotelephone. As the planes approach the field they are picked up on the scope of a shorter-range radar. Then an operator "talks them down," watching each plane on the radarscope as it comes down toward the runway and telling the pilot how to alter his course to stay on the correct path to land safely.

More amazing than either ILS or GCA, perhaps, is Teleran (Television-Radar Air Navigation), which enables a pilot actually to see himself come down. A radar set on the ground picks up all aircraft in its vicinity and shows them on its scope.

A continuous view of the scope is sent by television to each plane. Each pilot sees on his television screen little spots of light that represent his and all other planes near him, with his own marked in a special way, all moving across a map.

On the screen, too, he sees a line that directs him to the proper runway, and he can find his way down by watching the movements of the spot representing his own plane as he glides to a landing. Teleran is still under test.

To guide airplanes more surely from one field to another, the CAA is rapidly blanketing the United States with new radio range stations operating on very high frequency. On a map these radio ranges look like a series of wheels with 90 spokes, each wheel overlapping those around it. The hub of each wheel is a radio sending station on a mountain or other high point. Each "spoke" is a radio beam being sent out in a certain direction.

A pilot flying, say, from Chicago northwestward to Minneapolis follows the spoke of the Chicago radio range that points most directly toward Minneapolis, to a point where it overlaps with another spoke that extends out southeast from the Minneapolis "wheel." Following two overlapping spokes or beams in this way, a pilot can find his way unerringly between any two points in the United States. A right-left needle on a dial in the cockpit

U. S. Navy, Official

Navy's Skyrocket, Built to Fly near the Speed of Sound, Resembles a Swordfish

It is driven by both jet-propulsion and rocket engines and is designed to fly at 650 to 750 miles per hour. The sharp "lance" on the nose contains the Pitot tube, an air-pressure measuring device that operates the air-speed indicator. If the pilot needs to escape from the plane while flying at high speed, he can detach the entire nose section. After it falls clear, he can open his parachute.

shows the pilot whether he is "on the beam" or off to the right or left.

With these new ranges, too, parallel courses side by side or at various levels can be set up on heavily traveled air routes.

Operating on very high frequency, the new radio ranges cannot be distorted or drowned out by static. The old low-frequency radio ranges, which the new ones are replacing, often were least reliable in bad weather when they were needed most.

Radio Guides Planes Across Oceans

To guide large airliners making transcontinental and transoceanic trips with only one or two stops, still another type of radio direction finder is being installed, which enables a pilot to follow a great-circle course across land or sea without bothering with the short-range overlapping radio beams.

As another aid to guiding airplanes across the oceans, the wartime magic of Loran (Long-range Navigation) is coming into peacetime use. With a special receiver in the plane the navigator picks up two radio signals sent out from widely separated radio stations on shore.

From a quick calculation of the difference in the time of arrival of the two signals, even though it be a tiny fraction of a second, the navigator can determine with great accuracy his exact position, making him independent of navigating by the stars.

Keeping watch, too, over the heavily traveled air route across the North Atlantic are ships serving as ocean weather stations, maintained by international agreement. These ships supply airplanes with navigation information and weather reports by radio and are ready to speed to the aid of any plane forced to land in the sea, as was dramatically demonstrated when the U. S. Coast Guard cutter *Bibb* saved 69 persons from the flying boat *Bermuda Sky Queen* when it was forced to land in heavy seas last autumn.

Just before World War II the United States began installing a Nation-wide system of air markers, signs painted on rooftops or outlined on the ground, which in daytime would show any pilot, especially those of low-flying private aircraft, the direction to the nearest airport, its location, and true north.

When war came, these markers were removed lest they be useful to enemy aircraft,

U. S. Navy, Official

Rival for Navy Planes and Guns: A V-2 Rocket Is Fired from the Carrier *Midway*

This first successful launching of such a weapon from an aircraft-carrier deck took place September 6, 1947. It portends an increasing use of rockets and guided missiles by the U. S. Navy. Launching of the V-2 did not interfere with the operation of the *Midway's* planes, which took off immediately after the firing of the rocket (page 271).

Consolidated Vultee

With a "Flying Automobile" You Can Travel by Air or Highway

Upper section of this experimental craft, including wings, tail, and airplane engine, may be detached from the lower part, which then can be driven on the ground, using a separate motor. It is intended for a combination personal aircraft and auto. The four wheels have shock absorbers for landing (page 249).

but now they are being reinstalled. An arrow points due north with the latitude and longitude on either side of it, and another arrow indicates the direction and distance to the nearest good landing field.

Hot air, blown through hollow spaces in the leading edges of wings, control surfaces, and propellers, is used on newer aircraft to prevent formation of ice, which otherwise can spoil the lift of a plane and throw it out of control. Formation of ice on windshields is prevented by use of a new glass containing salt crystals that conduct electricity through the glass.

Birds crashing through windshields and disabling pilots are a real hazard, especially on the great mid-continent "flyways" over which birds migrate in spring and fall; so Government researchers have developed "bird-proof" windshields. Chickens first killed by electrocution are hurled with air guns against experimental windshields at speeds up to 500 miles an hour to reproduce the impact of a bird in flight.

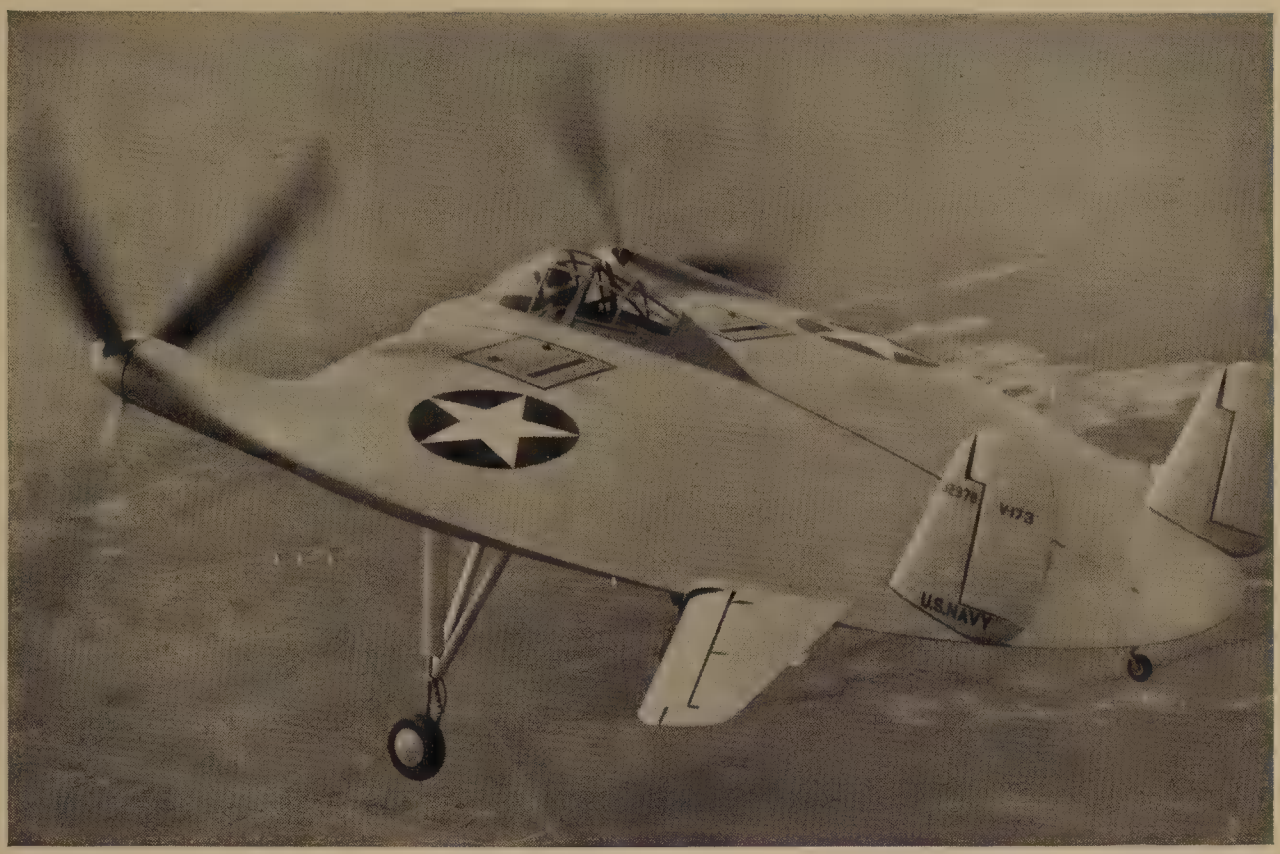
Noise of airplanes, which often has annoyed residents along the borders and approaches of airports, also is being attacked by researchers. An experimental almost-silent aircraft already has been flown by scientists of the National Advisory Committee for Aeronautics (NACA). Propellers, which cause most of the noise, are being redesigned with more blades and slower speeds.

Air Cargo Comes of Age

Shipment of cargo by air is one important way in which the Air Age is changing civilization. Almost every conceivable article has been shipped by air, from young elephants to live lobsters, ribbon, and eyebrow pencils (page 254).

Today, if a department-store manager in Des Moines or Dallas wants to try out a dress representing a new fashion trend on his customers, he need not order a large quantity from his New York wholesaler, taking a chance on a loss if they don't sell. Instead he can order a few, advertise them, and then if they begin to go like hot cakes, order more sent out overnight by air. Moreover, dresses in large quantities can be shipped on hangers, arriving unrumpled and not in need of pressing.

Some 2,000 firms, operating 4,400 planes and employing 8,400 pilots, are authorized to carry air freight and passengers on a nonscheduled basis in the United States. The regular scheduled airlines, too, all carry freight



United Aircraft

Nicknamed the "Flying Pancake," This Experimental Navy Plane Is Round and Flat

Intended for use as a fighter, it is designed to fly as fast as 450 miles an hour and to slow down to 40 miles an hour or even less. Its flying-wing shape minimizes drag. The designer originally set out to develop a craft which would perform both as an airplane in high-speed flight and as a helicopter flying almost vertically in getting in and out of small landing spaces.

along with passengers, and some operate separate freight airplanes.

Air freight is flown regularly overseas. There are even "tramp" air freighters that ply the air routes as tramp steamers ply the oceans, picking up cargo wherever it is available.

But passenger carrying today still is the main business of the airlines. More than 900 airplanes, three times the number in use before the war, now are flown regularly by the scheduled airlines alone in the United States. Across the Atlantic there is an average of about 60 airline flights each way per week, and over 30 each way weekly across the Pacific, contrasting with two before the war (page 253).

Some of today's big four-engined planes have two decks and include a lounge with snack bar. Hot beverages can be prepared on board, and in some cases meals are cooked on the ground, frozen, then thawed and served in the air hot and fresh. Men's and women's separate dressing rooms have washbasins, hot and cold water, dental bowls, full-length mirrors, and dressing tables.

Such planes seat from 50 to 80 people and some can sleep as many as 28 in berths. One has a private compartment with its own bathroom. Cabins are "pressurized," which means the air within them is kept at a pressure equal to that at about 8,000 feet altitude, permitting normal breathing while the plane flies at 18,000 feet or higher where the outside air is too thin to sustain normal life.

Commuters Travel by Air

Air commuting is well established. Congressmen, businessmen, and others who make regular trips between cities such as Washington and their homes keep standing reservations on certain airline flights every week.

Despite occasional accidents, airline travel is considered safe enough today so that most insurance companies charge no higher rates for it than for other modes of travel. By inserting coins in an automatic vending machine, you can buy an air travel life insurance policy for 25 cents per $5,000 up to $25,000 in the waiting room of your airport terminal, and mail it, in an envelope that is thoughtfully provided, to the beneficiary!

Airlines today cover the earth with a 500,000-mile network that reaches practically

U. S. Air Force, Official

Appearing Like a Huge Winged Dragon in Flight, the B-36 Is More than Twice the Size of a B-29

Length of its slim, cigar-shaped fuselage is 163 feet. It has reached a speed of more than 300 miles per hour and can fly 10,000 miles with a 10,000-pound load of bombs.

AP from Press Ass'n

World's Largest Airplane, the Howard Hughes Flying Boat, Built Mostly of Wood, Makes a Trial Flight

Powered by eight 3,000-horsepower engines, it was constructed during the wartime metal shortage. It contains millions of glued joints.

Consolidated Vultee

These 400 Men, or 50 Tons of Cargo, Could Be Carried in the XC-99, Which Has Two Decks and an Elevator

Dan Frankforter from Fairchild Aircraft

Even the Artillery Soon May Be Prepared to Fly, Dropping Guns by Parachute, in This Air-borne Age

A 105-millimeter howitzer drops out the rear door of a troop-carrier aircraft on a trial flight. Another parachute will open to stabilize its descent.

Northrop Aircraft

Resembling Some Prehistoric Bird, the YB-49, Jet-propelled Flying-wing Bomber, Trails Smoke on Its Take-off

Boeing Aircraft Co.

Knife-thin Wings, Set Back at an Angle, May Help This XB-47 Jet-propelled Bomber Fly Nearer the Speed of Sound

Its speed still is secret, but the unusual design of its wings and tail surfaces enables it to attain terrific velocity with less danger from severe air turbulence. Its six jet-propulsion engines are mounted in twin nacelles inboard under the wings and singly near the wing tips.

U. S. Air Force, Official

Two 10-pound Jet Motors Run This Air Force Helicopter, the "Flying Motorcycle"

Attached to the tips of the two rotor blades, the tiny power units push the blades around at 600 feet per second by the thrusting power of their jets of hot gases, eliminating need of heavy engine parts. In the picture the jet units appear as blurs whirling above the pilot's head. This experimental machine has flown 50 miles an hour. It weighs only 310 pounds and can lift another 300. It is intended for short-range observation, communication, artillery spotting, and courier service.

every nation, and make international ports of call out of such inland cities as Chicago and Kansas City; Asunción, Paraguay; and Madrid, Baghdad, and Fairbanks.

This network makes possible such trips as that taken recently by your Society's President, Dr. Gilbert Grosvenor, when in five weeks he flew to Norway to welcome a new grandchild; to İstanbul, Turkey, to revisit scenes of his early boyhood; and back to New York, circling Mont Blanc on the way, in time to attend his fiftieth Amherst College class reunion, with plenty of stopover time en route.

Returning, he flew from Shannon, Eire, to Gander, Newfoundland, in 6 hours 50 minutes, averaging 356 miles per hour at 18,000 feet, a good example of the speed of travel in this Air Age.

This global airline network is serving in very practical ways to bring about everyday down-to-earth "international understanding." A plane today on a one-way flight may operate over as many as 15 countries.

One of the great hindrances to international air travel is red tape.

Through the International Civil Aviation Organization and International Air Transport Association efforts are being made to cut red tape. They are trying to bring about the use of certain standard languages in air communications, adoption of standard systems of weights and measures, uniform procedures in handling passengers, mail, and cargo, standard regula-

Bell Aircraft

Dusting Maine Blueberries, a Helicopter Flies Only a Few Feet above the Crop

Chemicals to protect the berries from blight and insects have been spread over as many as 90 acres in an hour in this way. Dust is fed from hoppers into the downwash of air from the rotor blades, which carries it onto the plants. The helicopter flies from five to 10 feet above the ground at 20 to 30 miles per hour.

tions governing customs, immigration, and transmission of diseases by air. Even passenger tickets, baggage-checking systems, and cargo waybills are being standardized for the entire world to make air travel as simple, safe, and convenient as possible.

"We're trying to fix it," one air transport man explained, "so that, for example, a Venezuelan pilot, flying a British-made aircraft into a Chinese airport, landing in bad weather with the aid of an American-designed instrument landing system, supervised by a Czechoslovakian traffic controller, can make it without misunderstandings or confusion! Such a case today would not be an exaggeration."

For general usefulness and versatility, no aircraft can vie with the comparatively slow, ungainly helicopter. Only about 10 years ago the helicopter was just being developed. Today it does almost everything that a man could do if he had wings of his own, and perhaps it comes nearer than any other type of aircraft to realizing the dream of flight that first inspired men to develop the airplane.

Helicopter, Jack-of-All-Trades

In Argentina, helicopters have flown into the midst of swarms of locusts to spread insecticides that effectively halted the insects' depredations. They have set down forest fire fighters on strategic mountaintops, supplied them with food, water and tools, and carried out trapped and injured men.

They have sprayed orchards in Sweden, dusted potatoes in Aroostook County, Maine, and spread DDT on Buffalo, New York,

Consolidated Vultee

Giant Multiple Landing Gear of the B-36 Superbomber Dwarfs the Men Who Fly It

Eight such wheels, nearly five feet high, support the main section of the U. S. Air Force plane, which weighs 65 tons empty. With its tonnage thus distributed, it can utilize fields where runways might otherwise be unable to bear its weight. Wing span is 230 feet. It is propelled by six 3,000-horsepower engines (page 260).

dumps to kill flies suspected of spreading polio. They have saved cherry orchards in California, wetted by an off-season rain, from heavy loss by flying slowly three feet above the treetops. The downdraft of the spinning blades blew the moisture off the fruit, which would have been injured if the sun had warmed it while still wet.

They have laid pipe lines in places difficult to reach by land for the Army Engineers, served as lofty vantage points for Connecticut State Police officers to unsnarl traffic jams not visible in their entirety from the ground, and carried movie cameramen aloft to take thrilling action shots.

For the Air Force, Army, and Navy they carry messages where radio cannot be used, landing easily on a battleship or cruiser, and perform reconnaissance and rescue work impossible for faster aircraft, since a helicopter can land in any small space, even on water, can hover a few feet off the ground, and can fly slowly enough for careful observation of ground objects (page 251).

Personal airplanes and private flying have a great future, Government aviation experts believe, despite the fact that the production of private planes recently has decreased considerably since the period immediately after the war.

One problem is that, as shown by a recent Government survey, the largest part of private flying is done by young people, who usually are least able to afford to own and operate an airplane.

More miles are flown yearly in the United States by private aircraft than by those operating on the commercial airlines. Flying schools now are operating in all the 48 States, Hawaii, and Alaska, though many of these depend chiefly on veterans learning to fly under the GI bill of rights.

"Flying Farmers"

Farmers and ranchers use planes to check the extent of soil erosion on their land, since the beginnings of gullies and other signs of trouble can be spotted readily from the air. They use planes also to check fences, condition of the range for grazing, and to locate cattle, sheep, and lost lambs. They have flown an average of 247.2 hours a year, an unusually large use of personal planes. Several active "Flying Farmers" organizations exist.

Two Piper Cub light planes, equipped with extra gasoline tanks, radios, blind-flying instruments, and gyrocompasses, last fall flew around the world. Several members of Congress who are light-plane pilots have their own flying organization.

In Brazil I met a Presbyterian missionary who has a small plane, equipped with a stretcher, which he uses to visit scattered congregations and to transport the sick from remote interior villages to hospitals. Catholic priests of the Oblate Order have learned to fly so that they can use planes in their mission work in Canada.

Never before in all his experience has man had to deal with conditions like those encountered both by airplanes and by the human body itself in the process of flying at the terrific speeds and dizzy altitudes that today's aircraft already have attained or soon will reach.

When the Navy's experimental plane, the Skystreak, flew at 650 miles per hour, air friction heated the cockpit to a temperature of 170 degrees F. A refrigerating system had to be installed which reduced the temperature to 105, more nearly bearable for the pilot.

Ever-present, too, all through the atmosphere, invisible but menacing, is the pounding, smashing, turbulent force that engulfs an aircraft when it nears the speed of sound. Air molecules, pushed ahead of an airplane wing like the bow wave of a ship, cannot get out of the way fast enough when the speed of sound is approached. The smooth flow of the air back over the airplane wing is disturbed. Eddies are formed that batter and tear at the aircraft structure, and can damage the surface or even throw the plane out of control.

To overcome this danger, wings of fast fighter planes today are almost as thin and sharp as knife blades, enabling the plane to slice through the air with a minimum of disturbance.

Already planes have flown very close to the speed of sound. This speed varies with temperature, 760 miles per hour in the warm air near sea level but only 660 in the colder air at 35,000 feet. Strangely enough, once a plane is flying well beyond the speed of sound, the turbulence of the air flow disappears and the buffeting forces cease.

Strange Perils of the Upper Air

Airplanes can be built to withstand and overcome the strange conditions met aloft, but the human body is not designed to cope with them. Hence the new science of aviation medicine has developed ways of extending the body's capacity by artificial means.

Send an unprotected man above 10,000 feet and he is breathing air so thin that it does not contain enough oxygen to enable him to function normally. His mind will be affected by the lack of oxygen, spoiling his

U. S. Air Force, Official

Sealed in a "Pressurized" Suit, a Pilot Can Fly in a Near-vacuum Far Aloft

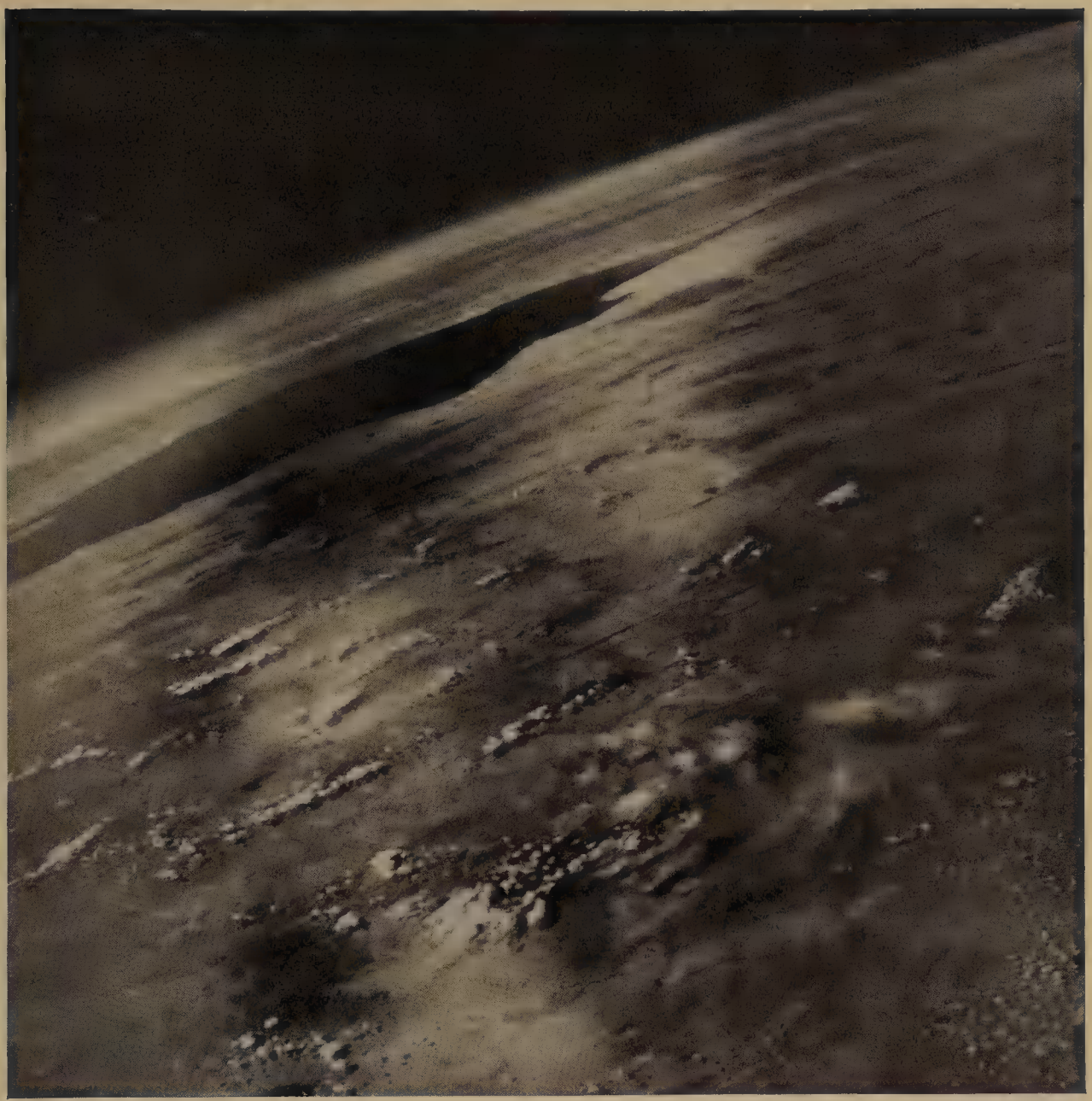
This rubber garment, with transparent "helmet," is an experimental model used in development of a less cumbersome, later-type suit that will enable Air Force pilots to fly safely to altitudes where normally the air is too thin and atmospheric pressure too low to support life. The man in the suit wears an oxygen mask as an extra precaution, but normally breathes air pumped into the suit and kept at a pressure equivalent to that a few thousand feet above sea level (page 269).

judgment. If by some chance he should reach an altitude of 63,000 feet without freezing in the 75 to 90 below zero cold, his blood will boil as a result of the decreased atmospheric pressure.

If his plane goes out of control and he tries to bail out while flying at high speed, he may find himself pushed back into the cockpit by the tremendous force of the air stream. If he opens his mouth the air pressure ramming down his throat may rupture his lungs and kill him. The air stream may even tear the flesh from his face, break his arms, and, if he does get clear, flatten him against the tail of his plane.

Even if he does somehow escape, the shock of the opening of his parachute may disable him, and in any event he probably will die from lack of oxygen and cold before he gets down to lower altitudes where the air is dense enough to support life.

But the U. S. Air Force and Navy have found ways to avoid these horrors. Pilots of fast fighter planes today are being trained to use the "ejection seat," so arranged that when a pilot needs to bail out he explodes a



U. S. Navy, Official

Earth's Curve and Gulf of California Show in a Picture Taken 100 Miles Aloft

Snapped by an automatic camera on a V-2 rocket fired at White Sands Proving Ground, the photograph includes 200,000 square miles of the United States and Mexico, an area the size of France. Dark patch is the Gulf of California, with the peninsula of Baja California and the Pacific Ocean beyond. Curvature of the earth is apparent on the distant horizon, rimmed with white clouds. Groups of small white clouds in the foreground cast black shadows on the ground below.

cartridge which literally blows his seat, with him strapped to it, clear of the plane.

"Bailing Out" Inside a Capsule

Before he does this he pulls down a visor, like that on a knight's helmet, to protect his face from the air stream. Still in the seat, he falls free to a safe altitude, at which an automatic device worked by atmospheric pressure opens his parachute. Meanwhile, he breathes through a mask equipped with enough oxygen to last him during the fall.

As further protection, pilots can be equipped with a special suit, "pressurized" to protect them from the effects of low atmospheric pressure (page 268).

The next step, says Maj. Gen. Malcolm C. Grow, the Air Surgeon, will be to place the pilot inside a transparent capsule, air-conditioned, pressurized, and supplied with oxygen. When he needs to bail out, the whole capsule, with him inside, will be blown clear of the plane.

He will fall, inside his capsule, down to an altitude where his parachute can open without too much of a jerk. His capsule will be water-

U. S. Air Force, Official

Rocket-powered Missiles Like This May Be Fired at Hostile Planes Effectively

Trailing smoke, a test model of the Air Force's GAPA (Ground-to-Air Pilotless Aircraft) zooms aloft at supersonic speed. Development of various types of guided missiles is under way (page 272).

proof, in case he should land in the ocean, and will be supplied with emergency rations, water, and perhaps a life raft.

Studies are being made of the possible effects of cosmic rays, powerful ultraviolet rays from the sun, and meteors not dangerous in the lower atmosphere but which may be a real hazard in very high altitude flight, where the air overhead is too thin to serve as a protective screen. Your Society, with the Bartol Research Foundation of the Franklin Institute, is working with the Air Force on a study of cosmic-ray effects.

The Navy, like the Air Force, has jet-propelled fighters, has fired at least one V-2 rocket from a carrier deck, and is preparing for the use of long-range rockets and guided missiles, fired from ships.

Bombers Can Refuel in Air

On long bombing missions, planes may be refueled in the air. After flying almost to the limit of their fuel capacity to attack a distant target, bombers might rendezvous with tanker planes to take on fuel for the journey home, though this would not be practical for huge formations such as the 1,000-plane fleets that hit some German cities.

New bombsights for pilotless aircraft that may operate by automatically taking bearings on certain stars as a guide to the accurate dropping of bombs are being considered by designers.

New machine guns with far greater speed of fire have been developed for the new jet fighter planes. A pilot of such a plane making a head-on attack at 600 miles an hour against a bomber traveling at similar speed would have only two seconds to fire after coming within range before he would have to turn aside to avoid colliding with his target!

Guns also are recessed almost wholly within the aircraft's "skin," for if they protrude they cause so much drag that the plane is slowed down beyond the point of usefulness.

Radar already is being used to figure range and automatically keep guns pointed at the target. The next steps may be to develop bullets or other projectiles that ride some kind of beam to the target or that perhaps contain within themselves a device that guides them to it.

Today's fast military aircraft are driven by rocket or jet-propulsion engines, which move forward by reacting against the thrust of a jet of hot gases streaming rearward from a nozzle. Both rocket and jet engines get their power from the burning of a mixture of oxygen and some form of fuel such as oil or alcohol.

Jet engines carry their own fuel, but get oxygen by scooping in air as they go, which is compressed either by a turbine near the intake or by the forward speed of the engine itself.

Rockets carry both fuel and oxygen in tanks, and therefore are independent of the air around them and can operate at great heights where the air is too thin to supply enough oxygen for jets. They can even travel in outer space where there is no air at all.

Future Jet Planes May Burn Metals

Jet engines burn fuel at a terrific rate, and jet-powered aircraft flying at the speed of sound have little room for fuel in their thin, knife-sharp wings and small fuselages. This limits their flying range; so jet-powered fighters of the future may burn, not gasoline or fuel oil, but metals such as boron or aluminum in powdered or liquid form that provide far higher energy than oil for the same volume. Some planes may eventually use atomic power, which has 50 million times more energy than gasoline!

All American jet-powered aircraft today use the turbojet engine, in which the blast of hot gases within the engine turns a turbine wheel that operates an air compressor at the air intake in front. Blades on the turbines must stand temperatures so great that they melt ordinary metals; so new materials composed of metals and ceramics bonded together are being developed.*

Another type of jet engine is the ramjet, which has no air compressor. When it gets up to 400 miles an hour its speed alone "rams" air into its forward end hard enough to compress it for burning with the fuel. Since ramjets won't work at less than 400 miles per hour, they will be used on planes or guided missiles that employ some other kind of power to get them up to the speed at which the ramjet begins to function.

Guided Missiles, Weapons of Future

Guided missiles and rockets, operating without crews by remote control and launched from one continent against another, still are far in the future, experts agree. One difficulty is that not even with the best maps available could a long-range missile be preset to hit accurately a spot several hundred or thousand miles away.

Meanwhile, however, scientists are pushing development of guided missiles (page 270).†

* See "Steel: Master of Them All," by Albert W. Atwood, National Geographic Magazine, April, 1947.

† See "Air Power for Peace," by General of the Army H. H. Arnold, National Geographic Magazine, February, 1946.

National Advisory Committee for Aeronautics

Soaring by Rocket Power, This Guided Missile Is Prophetic of a New Kind of Combat

Developed for experimental purposes, the 14-foot model is being launched by a "rocket booster," the tube-like device with fins attached to the tail. The booster accelerates the missile to 600 miles per hour in three and one-half seconds, then drops off, and an internal rocket engine takes over the propulsion. This missile is named Tiamat, after a warlike Assyrian-Babylonian goddess.

One type, powered by a rocket engine, already has been flown successfully. It is not a weapon but an experimental model for use in developing guided missiles in general. Significant, perhaps, of the frightful possibilities of a guided-missile war, it is named Tiamat, after an Assyrian-Babylonian goddess who waged war against Marduk, king of the gods.

"Basic scientific principles needed for the development of guided missiles are all known," an expert told me, but the practical difficulties in the way of producing useful guided missiles are tremendous.

Guided missiles being considered for development include types for use from the ground against planes or other missiles, from the ground against distant ground targets, from the air against ground targets, or from plane against plane.

Theoretically it is possible to build "satellite" aircraft which would circle the earth for reconnaissance of enemy territory or for use as weapons to be guided against a distant target; missiles that would plot their own courses by "tracking" on the stars, moon, or planets; missiles guided by following the lines of force of the invisible field of magnetism that surrounds the earth; missiles to ride radar beams to the target; missiles that would "home" on a target with devices sensitive to light or heat.

So fast is aviation progressing that it's hard to keep our imagination anchored to earth. One Yale professor already has stated that "interplanetary travel may well become possible in our lifetime." But, he goes on, we earth dwellers may not be the first to have accomplished it. He suggests it is quite possible that intelligent life exists on Mars, and that Martians even may have already visited the Earth undetected! If so, our Air Age is pretty far behind the times, after all!

Shawneetown Forsakes the Ohio

By William H. Nicholas

With Illustrations by Staff Photographer J. Baylor Roberts

"THERE you are," said my driver. "See where it says 'Shawneetown' on the water tank? Moving that big tank up the highway for more than three miles was some job. And they moved it standing straight up, too, just like it is there."

We were coming into the newest, and at the same time the oldest, town in Illinois—a proud river settlement which has stood up to the angry floodwaters of the Ohio River every year for nearly a century and a half, sometimes holding firm, sometimes yielding.

However, in January, 1937, the "Beautiful Ohio," in its most unbeautiful aspects, had conquered most of the stout-hearted river folk at last.

Shawneetown dug itself out of the muck left by the receding waters of its greatest flood and took stock. Most of the citizens decided to move bodily this community of nearly 2,000 persons to higher ground three miles back from the river.

Today about 1,600 people live in New Town, safe from threat of flood, while some 400 others cling to their riverside homes in the lee of the levee at Old Town. A narrow strip of land joins the two sites, so Shawneetown now embraces both areas within its town limits.

Rooted Deep in the River Bank

Shawneetown may be likened to a giant tree on the edge of the Ohio River, toppled but not killed in a storm. Old Town is the roots, representing the source of life, tradition, and historic heritage; New Town, the branches and leaves, representing growth and progress; the strip of land between, the trunk.

I wanted to see the roots first, the flood-wracked site of Old Town, and learn something of its history, its heritage, and the determination of its inhabitants.

As early as 1817 an English traveler took note of the settlement's exposed position. Wrote Morris Birkbeck in his *Notes on a Journey in America:*

"This place I account as a phenomenon evincing the pertinacious adhesion of the human animal to the spot where it has once fixed itself. As the lava of Mount Etna cannot dislodge this strange being from the cities which have been repeatedly ravaged by its eruptions, so the Ohio, with its annual overflowings, is unable to wash away the inhabitants of Shawneetown.

"Once a year for successive springs it has carried away the fences from their cleared lands, till at length they have surrendered and ceased to cultivate them.

"Once a year the inhabitants either make their escape to higher lands, or take refuge in their upper stories until the waters subside, when they recover their position on this desolate sandbank."

When Birkbeck visited Shawneetown it was 17 years old, settled by pioneers from Virginia who came down the Ohio River to establish a trading post with the Shawnee Indians.

More than a century before, French buffalo hunters coming from the north had discovered near by a group of salt wells, which later were to be a source of Shawneetown's early wealth. The French developed this salt business so that "the Royal subjects of His Majesty King Louis XIV might have a regular supply." But the Shawnees drove them out about 1735 and destroyed their fort and blockhouse, named "Equality."

The Virginia pioneers found the Indians busy evaporating salt near the ruins of Equality. The white men inspected their handmade evaporating pots, crude mixtures of clay and crushed shells (for lime) about four feet in diameter, and investigated the possibilities of salt manufacture on a large scale.

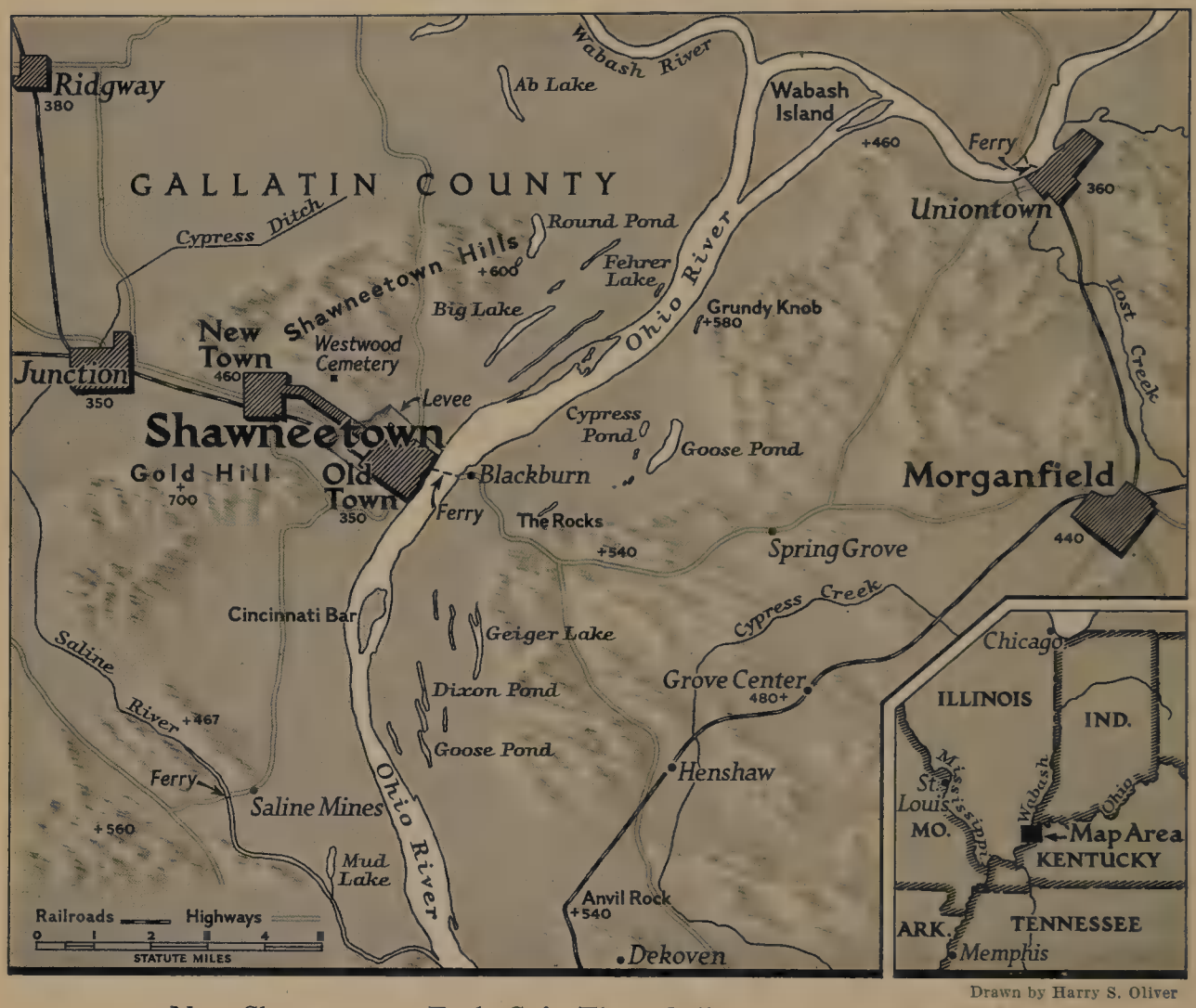
They bought out the Indians, who went away peacefully, and then interested Washington in the future of Shawneetown.

Government Plotted Shawneetown

In 1810 Federal Government surveyors laid out a city plan for the new settlement, providing for broad avenues, wharf and business areas, and tree-shaded residential streets. Shawneetown, like Washington, D. C., was officially plotted by the Federal Government. The wide streets and the fine old trees remain today, a tribute to the vision of those early city planners.

On old French maps the spot had been marked as Shawneetown because of the Shawnee village there. The name was retained so that flatboat men on the Ohio between Pittsburgh and New Orleans, familiar with these maps, would know where to find the new town.

Strangely, Shawneetown did not become the oldest city in Illinois until 1910. The State's first permanent settlement was Kaskaskia,



Drawn by Harry S. Oliver

New Shawneetown Feels Safe Three Miles Back from the Ohio

Although Cypress Ditch, beyond the city limits, may overflow and cut off the area by road from the rest of Illinois, New Town is not threatened with inundations, frequent fate of Old Town despite its levee.

founded by the Jesuit Gabriel Marest in April, 1703. When Illinois was admitted to the Union in 1818, Kaskaskia became its first State capital. But in 1881 the Mississippi River began to encroach on Kaskaskia, and by 1910 this historic town was at the bottom of the river. Shawneetown, second oldest city, thus became the oldest.

Shawneetown grew with the development of its salt industry.

The salt men floated big iron evaporating kettles of 45- to 90-gallon capacity down the Ohio from Pittsburgh to Shawneetown and moved them inland to the wells. Their coming was hard on the wild animals for miles around. Through the centuries these creatures of the forest had beaten paths to the salt licks.

The salt producers dug long trenches in the ground, placed the kettles over the trenches in long rows, put chimneys at one end of each trench, and kept huge fires blazing beneath the kettles. Slaves performed the tedious work of tending the evaporating fires.

John James Audubon, the famous naturalist, contributes an interesting footnote to the history of Shawneetown's salt wells in his description of vast flocks of passenger pigeons which he observed during his trip down the Ohio River in 1813.

One Flock Exceeded a Billion Birds

Near Louisville, Audubon had seen a flock of these birds which numbered more than one billion. Of his next experience he wrote:

"I have seen the Negroes at the United States' Salines or Saltworks of Shawneetown wearied with killing pigeons, as they alighted to drink the water issuing from the leading pipes for weeks at a time. . . ."

Yet a century later, the passenger pigeon, victim of man's ruthlessness, was extinct. The last known passenger pigeon died in 1914 in the Cincinnati Zoo.

When Illinois was admitted to the Union in 1818 as a free State, an article in its constitution specifically excepted the area

Lawyers Try a Case Beneath a Historic Mural in Gallatin County Courthouse

The old-time river scene above the judge and witness shows salt barrels going aboard a flatboat. Evaporating kettles bubble at left in the painting (page 274). This picture was made from the courtroom balcony (foreground). Counsel sits at table in center; a bailiff occupies the jury box (upper right).

Hurtik Studio

Shawneetown's Bank Kept Doors Open for the Skiff Trade Throughout the Flood

Business was conducted on the second floor from January 26 to March 17, 1937 (page 287). Not until St. Patrick's Day was the high first floor free of water. Sixteen people made the upper story their home during the inundation. This photograph was made in February. High-water mark is visible on pillars.

around the United States Salines and permitted the use of slaves there until 1825.

As the timber near the wells gradually disappeared in the flames, the salt producers discovered that it was cheaper to move the kettles back into the forests than to transport the fuel over long distances to the wells. Ingeniously, they set up a primitive pipe line.

Pipe Line for Brine

They felled trees 10 to 16 inches in diameter, and 12 to 20 feet long. Then they bored two-inch augur holes through the logs. The opening at the butt end of each log was reamed out, and the small end was tapered. The tapered end of one log was forced into the reamed end of another. Iron bands kept the butt ends from splitting. In this manner the brine from the wells was piped out over hills and small streams to the kettles three to four miles in the forest.

When the salt industry was in full swing production exceeded 120,000 bushels a year. Hundreds of men were employed—loggers, wood-haulers, evaporating pan hands, coopers, inspectors, storekeepers, rivermen. The barrels of salt were hauled to Shawneetown and shipped there by riverboat to Pittsburgh and New Orleans, from where they were distributed throughout the East and the South.

High and Dry Stands Old Town's Greek-temple Bank in Peaceful Midsummer

Architects admire the lines of the imposing building, which is now unused and belongs to the State of Illinois. The Doric sandstone columns were floated down the Ohio River from Pittsburgh on flatboats. The sun has not yet obliterated the high-water marks made on the columns eleven years ago (opposite page).

A mural in the courtroom of the Gallatin County courthouse gave me a good impression of the bustle at the Shawneetown wharves of a century ago, with hundreds of barrels of salt going aboard a line of flatboats (page 275).

I drove out to one of the old salt wells with Finch Stubbs, a young historical enthusiast of Shawneetown, and it was fortunate that he went with me (page 283).

Today the spring has been reclaimed by the wilderness. Off a small side road, it still bubbles concentrated brine as of yore in its casing of old cypress timbers. It still leaves a salty deposit along the edge of its tiny outlet as it trickles in the direction of the Saline River. Its pungent, sulphurous odor is noticeable 50 yards off. But it was difficult for me to believe that once this well was the center of a thriving industry.

An important event for Shawneetown occurred in December, 1810, when Illinois Territory granted a ferryboat license to Alexander Wilson. This made the town a focal point for immigrants from Kentucky and Virginia.

Flood Checks Real Estate Boom

Adding to Shawneetown's importance, Congress in 1812 established there the second land office in Illinois Territory. Before it wound up its business it had disposed of more than

Hurtik Studio

A Grain Elevator Moves Lumberingly up the Road to Higher Ground

This big structure and the city water tower provided the toughest problems in the mass migration of buildings from Old Town to a new site three miles away. A total of 237 private residences were moved, all while being occupied.

Shawneetown's Levee Cuts Off a River View from Illinois' First Bank

Built in 1811, it was the first brick building in the town, and the third to be erected in Illinois. The vault was a well, covered by a trap door upon which a guard slept at night.

2,600,000 acres to former soldiers and other homesteaders who moved into the West.

Shawneetown experienced a real-estate boom. The carefully laid out town lots were sold at high prices.

Then, in October, 1814, the Ohio River went on a rampage, and water 20 feet deep covered the building lots when the river reached a crest of 55 feet. Frantic purchasers petitioned Congress to get their money back, but their pleas went unheeded.

John Marshall, a young Vincennes, Indiana, merchant, heard of the boom, loaded up a flatboat with merchandise, and came down the Ohio to sell it. He was intrigued by the prospects of the new settlement and decided to stay.

In 1811 he built the Marshall House, a two-story brick building facing the Ohio (above). It was Shawneetown's first brick building, and the third brick house in Illinois.

Two years later Marshall opened a private bank in his home. Then, in 1816, he became president of The Bank of Illinois, first banking institution chartered in Illinois Territory. Every night the money was lowered into a deep well, a trapdoor over it was closed, and a guard slept on the trapdoor.

Loan to Chicago Refused—"No Future"

Deep-rooted tradition tells that in the old Marshall Building Shawneetown's early bankers made a momentous decision. In 1827 a firm which was developing the new city of Chicago, Illinois, ran into financial difficulties.

A couple of their representatives rode horseback down to Shawneetown, about 300 miles to the south, to negotiate a loan of $1,000 to complete the job.

The Shawneetown bankers obtained an independent report on Chicago and its prospects and turned down the loan, the story goes, on the ground that Chicago was too far from Shawneetown ever to amount to anything.

The publisher of Shawneetown's first newspaper, the third in the State, arrived in the boom town by accident. One pleasant day

AP from Press Ass'n

Seven Weeks after the High Water of January 26, 1937, Shawneetown Remained Inundated and Isolated

Here, on March 17, the river has receded enough to reveal the top of the levee, coated with snow. Streets and lower floors of houses within the town still are flooded. While the Ohio remains high the water cannot drain away. At its peak the flood topped the levee by four and a half feet. Clump of trees, center, marks the Gallatin County Fair Grounds. Flooded Cypress Ditch, background, completes the encirclement of the town by water.

When the "Beautiful Ohio" Is Peaceful, Old Shawneetown's Main Street Seems Secure Behind Its High Levee

Safe from Ohio Floodwaters, New Shawneetown Stands on Elevated Ground Three Miles Back from the River (in Distance)

OLD SALT SPRING
A SHORT DISTANCE TO THE WEST IS THE "NIGGER SPRING" A MAIN SOURCE OF BRINE FOR ONE OF THE OLDEST SALT WORKS WEST OF THE ALLEGHENIES IN THIS VICINITY INDIANS AND FRENCH MADE SALT AND THE AMERICANS ESTABLISHED A COMMERCIAL SALT INDUSTRY WHICH OPERATED EXTENSIVELY UNTIL 1875

Encircled by Wilderness, Old Salt Spring Still Bubbles Brine

The historical marker directs visitors to the source of Shawneetown's early wealth (page 274). The Indians, then French traders, and later the frontiersmen evaporated the salt in kettles and finally built up production to more than 120,000 bushels a year. When cheaper sources of salt were discovered the spring was abandoned.

Knife Sharpeners Have Worn Down This Sandstone Block

The nine-foot "whetstone" for generations of residents is part of the solid front of Old Town's bank (page 277). The absorbed citizen is A. B. Thomas, who remembers every Shawneetown flood since 1884. About 400 people still prefer to live in their homes here rather than move to New Town, on higher ground.

in 1818 Henry Eddy was floating down the Ohio River on his way to St. Louis. With him he had equipment for a printing plant, for he expected to establish a newspaper in the Missouri city. His boat stuck on a sandbar opposite Shawneetown, and residents put out to offer help and talk with the stranger.

When the townsfolk learned Eddy's intentions, they talked him into landing at Shawneetown and staying there. He founded the *Illinois Emigrant* soon thereafter and later became one of the State's eminent lawyers and jurists.

Mrs. George Wiederhold, a descendant of both John Marshall and Henry Eddy, lives in Old Town today, finding in tradition and association the anchors to the scenes of her childhood which floods cannot tear away. She has done much to preserve the town's historic lore. Her home is a delightfully furnished second-floor apartment in an old building, from which she oversees the operations of her farms. Well able to live anywhere in the United States she chooses, Mrs. Wiederhold prefers her home by the river.

Town's Number One Hero Never Lived There

Although many famous generals and statesmen lived in Shawneetown at one time or another, including Maj. Gens. John A. Logan, John A. McClernand, and James Harrison Wilson, of Civil War fame, the town's Number One hero never lived there at all.

He is Maj. Gen. Thomas Posey, one of George Washington's trusted lieutenants and a hero of the Battle of Stony Point during the Revolutionary War. After three years as territorial governor of Indiana he became agent for Indian affairs for Illinois Territory.

In 1818 the General came to Shawneetown to visit his sons, who lived there. He was entertained at an old home on a knoll outside the town. While there he was stricken and died. He was buried in the garden outside the home, and this garden later became the town cemetery, Westwood.

General Posey's sons built the Posey building, which still stands in Old Town. Here Robert G. Ingersoll had his offices when, at one stage of his career, he lived and practiced law in Shawneetown.

In my wanderings around Old Town I called upon Mr. and Mrs. Louis W. Goetzman, who have lived in Shawneetown since their childhood (page 286). Mr. Goetzman came here in 1871 at the age of 11 from Uniontown, Kentucky; his wife arrived in 1875. Twice Mr. Goetzman has been the town's mayor.

They live on the second floor of a huge old brick house which fronts on the Ohio River. From their living-room windows they can look out over the levee and, except in summer when growth on the levee is lush, can see the steamboats ply up and down the Ohio.

"Why don't you move to New Town?" I asked Mr. Goetzman, and he began an elaborate explanation, giving many and sundry reasons. But they all boiled down to this—his love of the river, his love of the steamboats and their whistles, and his love of Old Town have kept him there. New Towns are all well and good for younger people, in his belief, but he and Mrs. Goetzman prefer to live in the old house which had been their home for 30 years, and in the community in which they were married 59 years ago.

I admired the beautiful old home in which they lived and the lovely Victorian furnishings.

"This house was built in 1860 by a father and stepson," he told me. "When the Civil War came, building stopped because all the carpenters and laborers went off to war. One of the contractors was a good shot, so they made him a sharpshooter. He served all through the war and came out at the end and went back to building. And he never applied for a pension. He ought to be remembered. His name was William Scanland."

The Goetzmans could have stayed in Shawneetown during the great flood of 1937, for their home was built high enough to be safe. The flood of 1884 covered the first floor with three feet of water; the 1937 inundation came to within two feet of the high ceiling.

But the Goetzmans obediently left when the mayor ordered everyone out. They stayed in near-by towns for five weeks, then they decided to come home. So, even before the waters had fully receded, they sailed into the front door in a skiff and settled down.

The Geography of a Flood

Nearly everywhere you go in Shawneetown you hear about the flood of 1937. But to understand how 1,636 townspeople got trapped in that terrible disaster, it is necessary to know something of the topography (pages 274 and 280).

Until 1875 there was no levee. In that year a levee was constructed around three sides of the town to an elevation slightly above the height reached by the flood of 1867. After a series of particularly destructive floods in 1880, 1882, 1883, and 1884, all of which flooded the town, the levee was enlarged and raised.

No further trouble was experienced until the high water of 1898, when one night the levee broke and a wall of water swept into the town, killing 26 people in as many minutes.

After being repaired, it successfully withstood all high water until the great flood of 1913. The flood that year exceeded all previous ones.

When it became apparent that the levee would be overtopped, the citizens of Shawneetown, in an effort to hold damage to a minimum, dynamited a portion of the levee on the south side of town and allowed the water to back into the town. It was well that they did, for the floodwaters overtopped the levee by two feet.

In 1933 another major rebuilding was carried out, and the levee was raised to a grade about two feet above the height attained by the 1913 flood, or 61 feet above low water (zero) on the Shawneetown gauge.

As I stood upon it and looked down at the placid Ohio, far below, it seemed almost impossible to me that those waters could ever rise to the top of the levee. Yet in 1937 the biggest of all Ohio floods did top it, and by about 4½ feet.

For 41 Years Guy Lambert Has Studied the Ohio's Moods

Thirty of them have been spent in operating the Shawneetown Ferry. Here he stands at the wheel of the *Margaret J,* which he piloted through half-submerged woodland while engaged in rescue work in the disastrous 1937 flood. He has become adept at dodging floating houses, barns, and uprooted trees.

About 10 miles upstream from Shawneetown the Wabash River empties into the Ohio. In the spring the Wabash often is in flood, and when this happens its waters break out of its banks and spill over into a usually dry drainage depression known as Cypress Ditch.

When the Wabash goes on a rampage Cypress Ditch gets completely out of hand, and its waters sweep over the lowlands back of Shawneetown, crossing the highway at the little hamlet of Junction, six miles to the west, so that Shawneetown itself is completely surrounded by water.

This rather common occurrence does not alarm the people of Shawneetown ordinarily. Sitting comfortably behind their levee, they are accustomed to being cut off from the rest of the State at such times. The residents of Junction take to boats, and when the water does not cover the Baltimore and Ohio Railroad tracks to a depth of more than two feet, the trains continue to pull slowly into Old Town with supplies.

In January, 1937, the Wabash overflowed, and Shawneetown was again cut off. Then, with the Wabash out of its banks, the Ohio began to rise at an alarming rate. Still the residents of the town were not too worried.

But on Thursday morning, January 21, when they got the river report from Cincinnati they suddenly awakened to the fact that they were trapped. They learned that the

Old Town Resident for 77 Years, Louis Goetzman Won't Forsake It Now

Both he and Mrs. Goetzman have lived in Shawneetown since childhood, and to them floodwaters of the Ohio are an old story. Twice he served as the town's mayor. Their pleasant Victorian home is on the second floor of a huge brick house built close to the water front in 1860, before the first levee was built. Even the flood of 1937 couldn't quite reach the high ceiling of its first floor (page 284).

crest at Cincinnati would be 73 feet (actually it was 80 feet on the 26th), and they knew that meant about 63 feet on the Shawneetown gauge. That was two feet higher than the levee! Actually, with the higher crest at Cincinnati, the water went about 4½ feet higher than the levee early in February.

A Race Against Rising Waters

The townspeople knew they had about three days of grace before the crest arrived, and that they must work fast. Fewer than one half were able to get out by boat.

Of the experiences of this group, those of Walter Cooper, the Baltimore and Ohio Railroad agent, and his wife are typical. They packed up their belongings and loaded them in a boxcar which, along with boxcars filled with house furnishings of other people, was pulled three miles up the railroad to a point near the new township high school, on high ground. The Coopers moved to the Riverside Hotel, fronting on the levee—a structure which no longer stands, but which was built in 1872 and at one time was among the finest hostelries along the Ohio River.

When the ferryboat was able to back up to the top of the 61-foot levee on Sunday, January 25, Cooper and his wife decided it was time to leave. So did many others.

Guy Lambert was at the helm of the ferryboat. His job was to cross the raging Ohio, cluttered with floating houses and trees and debris from farther upstream, and find some place to land on the other side (page 285).

Blackburn, Kentucky, the little river landing opposite, was under more than 50 feet of water. So Lambert headed across the river, ducked the sweeping debris, bucked the fierce current, and sailed for 2½ miles into the timberland over the tops of some trees and around other taller ones, until he came to high ground where he could effect a landing.

Tying up, he blew his whistle for several

Meeting Place for New Town's Bobby-soxers Is Helm's Drugstore

A few doors away the modern motion-picture theater shows "first-run" films. Soon to be completed on the Mall is the American Legion Community Building. Two new churches are under construction.

minutes. The residents of Morganfield, Kentucky, understood. In automobiles they followed the sound of the whistle and, on arrival, took off the passengers. Lambert headed back for another load.

Railroad lines from Kentucky into St. Louis were under water. The Coopers finally got back to the vicinity of Shawneetown by taking a boat across the turbulent Ohio to Evansville, catching the last train to Vincennes, and reentering Illinois by rail.

Nearly 800 persons, unable to get out of town by boat, had fled to the High School. The gymnasium, a separate building, was given over to storing their heavy goods, and they themselves were packed into the high school building like sardines when, on Sunday, the 25th, the water poured into the town. Junction was already thirty feet under water, and along the highway only the tops of the telegraph poles could be seen.

Relief forces—the Red Cross, Army Engineers, the State—went into action. Captain Lambert's ferry was converted into a hospital ship, and eventually he and others evacuated the people in the high school, many of whom were sick and injured. Before that date arrived, Lambert was busy taking people off housetops and other precarious perches. For the flood was not of a few days' duration. The high first floor of the bank was not clear of water until March 17.

Rowing into the First National Bank

Only 36 residents of Shawneetown remained in the town throughout the entire flood. Three of them were women. Another woman who braved the flood was Captain Lambert's wife. She remained on the ferry with him. Of those in Shawneetown, 16, including two women, held out on the high second floor of the bank. Twenty others stayed in the Fitzgibbons and Al Lowe residences, whose high second floors remained out of water.

Max H. Galt, cashier of the bank, and Carroll Goetzman, assistant cashier, didn't believe the flood waters could come up high enough on the first floor to enter the vault,

but they were wrong. At daybreak on Monday, January 26, they discovered that the water was more than four feet deep on the first floor (page 276).

So they obtained a skiff, sailed in the front door of the bank, and opened the vault door. The skiff wouldn't go into the vault, so they pushed a plank in and Galt climbed in on it. He slipped and went into the water up to his armpits.

"Get out of there," Goetzman advised. "You'll freeze to death."

"Might as well finish the job while I'm here," Galt replied, and, standing in the vault, he passed bank records out to Goetzman in the skiff. Meantime Goetzman told those above of Galt's predicament, and they started a roaring fire upstairs.

The job done, the two got out safely. Galt had eighteen one-dollar bills in his pocket, his own property, and they had been badly soaked. So he asked a companion to spread them out in front of the fire upstairs. Soon Galt and the bills both were dry, and the episode was closed. No bank funds were involved, for the money had been removed to the second floor several days before.

The story was told and retold and, as often happens, was elaborated upon by the different tellers. So, to this day, Galt chuckles when he recalls how it finally appeared in the newspapers.

"Max Galt," the newspaper accounts reported in effect, "cashier of the Shawneetown National Bank, dived into 30 feet of water to rescue $18,000 from the bank's vault!"

Fire Heightens Tragedy

Endless tales of suffering, heroism, humor, tragedy, are told of the 1937 flood in Shawneetown, which, of course, was only an episode in the terrible flood disasters of 1937 along the Ohio River. But a tragic aftermath in Shawneetown occurred several weeks later when the high school gymnasium burned down, with the possessions of scores of families who had frantically hauled them there.

While still encamped in the high school residents voted to move the town. It was inspiring to me to visit New Town and see what a determined community, with Federal and State aid, has accomplished.

Shawneetown wanted a fresh start. Even before the flood it had been worried about its future. In the 1850's railroads had passed it en route to the West, much to the jubilation of the river packet men. Then river commerce had steadily dwindled. Shipping of salt declined and finally stopped about 1875, following the discovery of cheaper sources of salt in Michigan. Before the Civil War Shawneetown had been displaced as chief financial and industrial center of Illinois.

When the big decision to move was made, Federal and State agencies combined to help the impoverished community.

When Pearl Harbor came most of the job had been completed, at a cost of about $1,500,000. On a 320-acre tract streets, sidewalks, sewers, and electricity had been installed; 237 Old Town houses left fairly intact by the '37 flood had been moved to New Town; and 127 new buildings had been erected. A new courthouse (Shawneetown is the county seat of Gallatin County) had been built (page 275).

A contest for the model for the new town plan was won by Mrs. Mary Long Whitmore, a landscape architect of Metropolis, Illinois. One of four professionals who competed with her was a professor under whom she had studied at the University of Illinois.

The business and residential section of New Town is on the north side of the highway. Its principal feature is the Mall, 250 feet wide, which bisects the entire section and is broken at a distance of 1,500 feet from the highway by the new courthouse (page 282). Most of the business houses parallel the highway, but there are also two business blocks fronting on the Mall. Beyond the courthouse are three churches, two still under construction, and off to one side the American Legion is erecting a community building.

To relieve the monotony of solid residential blocks, a wide boulevard, Posey Drive, enters the town at the western end of the highway, sweeps in a wide curve into the Mall near the courthouse, then curves back to the highway near the eastern end of the town.

In the industrial area, south of the highway, are the railroad tracks; a grain elevator for wheat, corn, soybeans, and oats; a dress factory; a sawmill; and a popcorn processing plant. Gallatin County is one of the biggest producers of popcorn in the United States.

Shawneetown is experiencing modest growth now. Since V-J Day about 15 new homes and several new business buildings have been erected. Others are being built.

New Town can be cut off from the rest of the State by floods, for the highway at Junction to the west still is subject to inundation from the Wabash River. But in such an emergency supplies can be transported over this low area by boat.

The main street of Old Town is 350 feet above sea level; the top of the levee, 367 feet.

Elevation of New Town at its lowest point is 390 feet, and at its highest, 460 feet. At that altitude New Town feels pretty safe.

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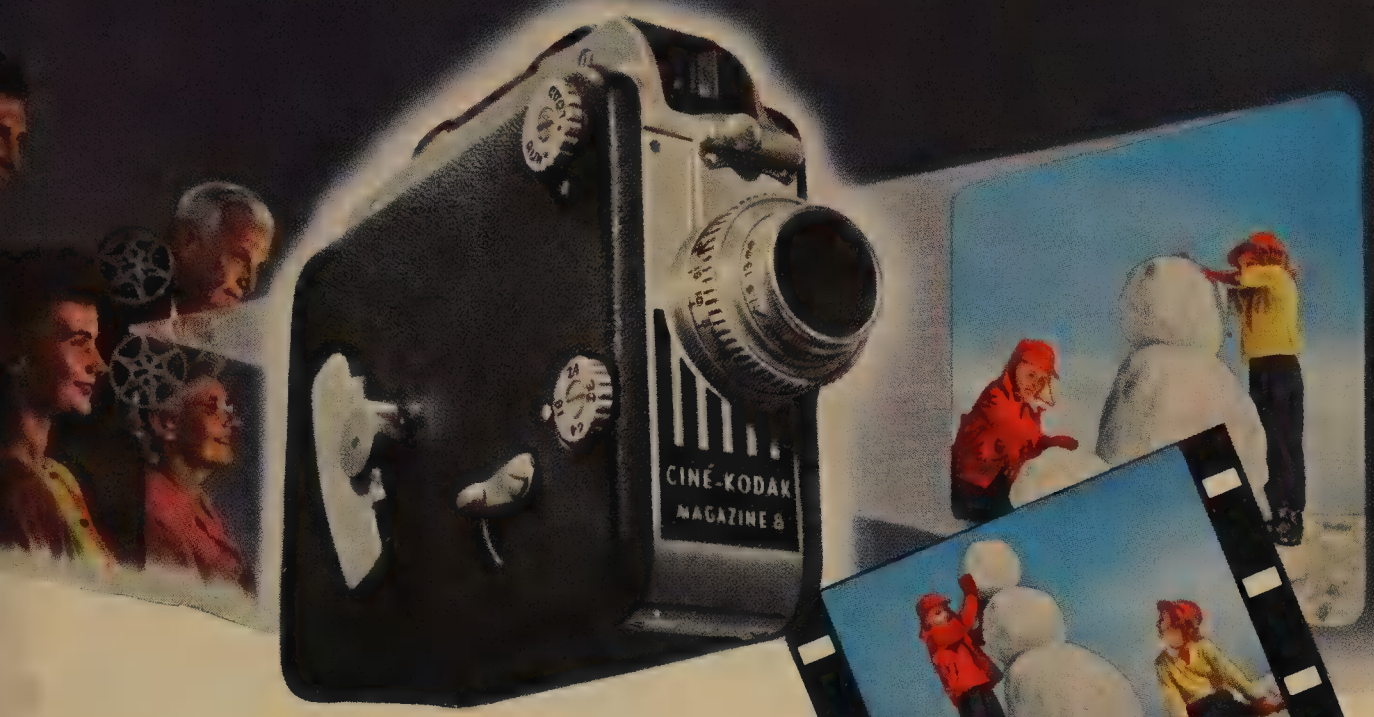

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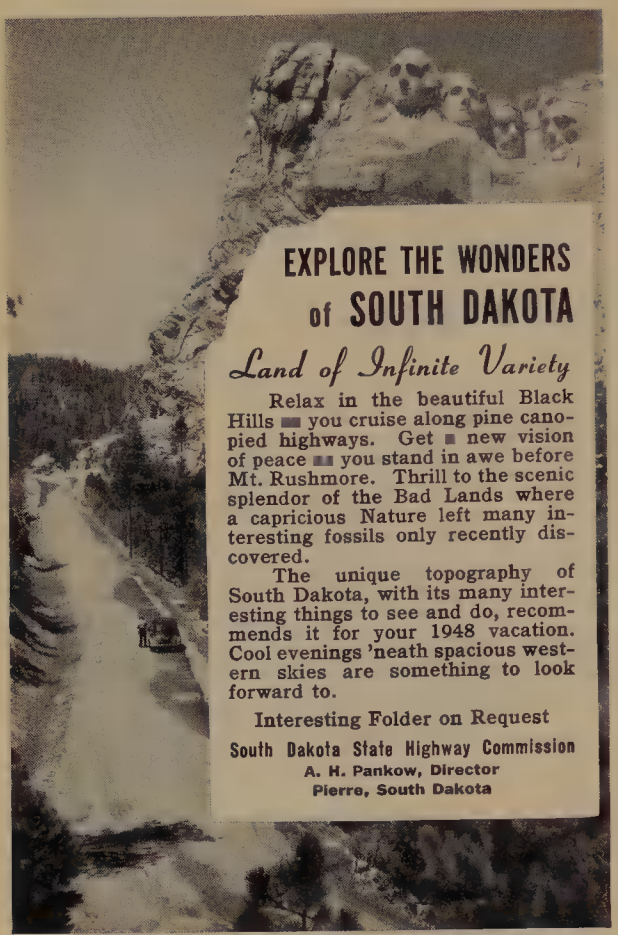

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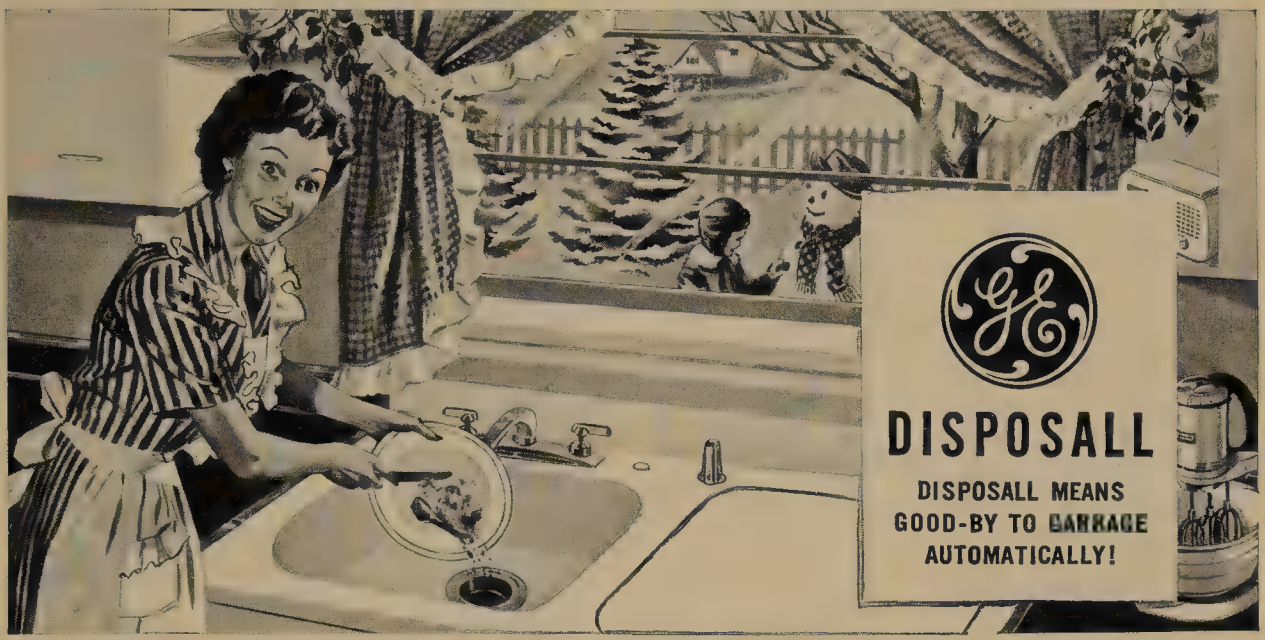

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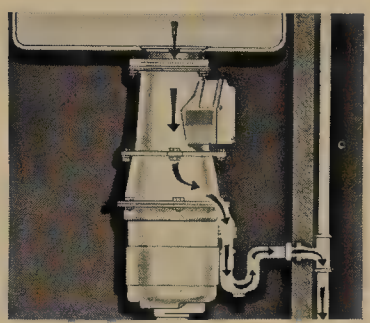
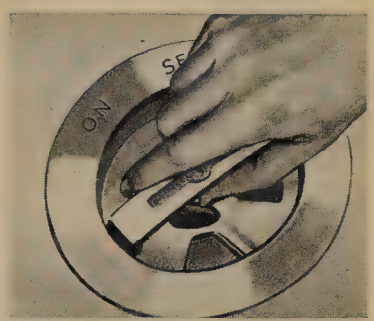
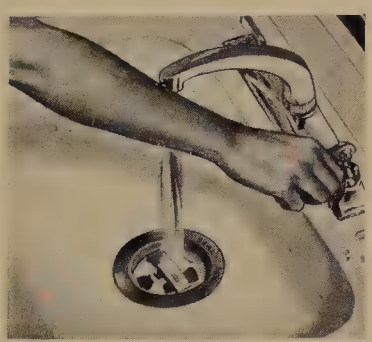


1. Out of sight, under the sink, the Disposall looks like this. A simple appliance that fits most any sink, it has a capacity ample for food waste from any one meal for an average family.



2. Protecting cover on sink drain is locked with twist to left, *once waste is scraped into drain opening.* Notice openings in the cover, for clean, flushing water to enter the Disposall as it works.



3. Turning on cold water automatically starts Disposall. Food waste is shredded into tiny particles, flushed into sewer or septic tank. No more garbage . . . ever!

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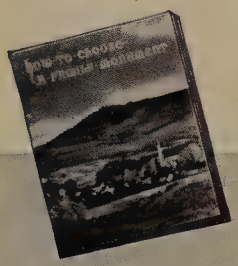

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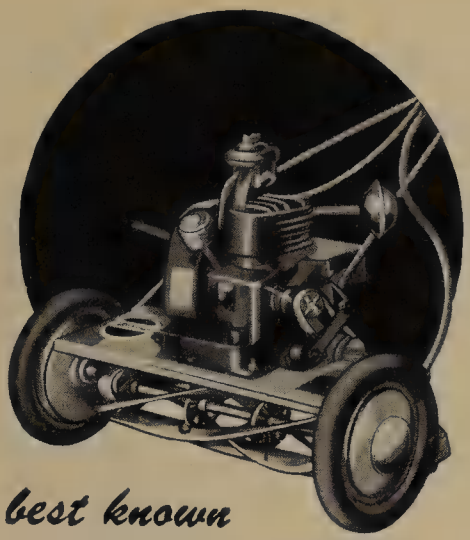

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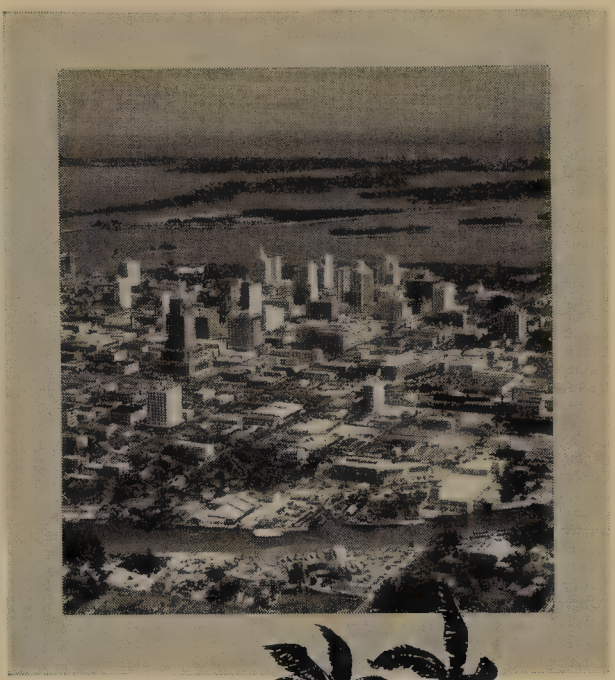

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In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

The Society's notable expeditions have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic. By dating the ruins of the vast communal dwellings in that region, The Society's researches solved secrets that had puzzled historians for three hundred years.

In Mexico, The Society and the Smithsonian Institution, January 16, 1939, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 B. C. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

On November 11, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to the world altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, and obtained results of extraordinary value.

The National Geographic Society-U. S. Army Air Forces Expedition, from a camp in southern Brazil, photographed and observed the solar eclipse of 1947. This was the seventh expedition of The Society to observe a total eclipse of the sun.

The Society cooperated with Dr. William Beebe in deep-sea explorations off Bermuda, during which a world record depth of 3,028 feet was attained.

The Society granted $25,000, and in addition $75,000 was given by individual members, to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California were thereby saved for the American people.

One of the world's largest icefields and glacial systems outside the polar regions was discovered in Alaska and Yukon by Bradford Washburn while exploring for The Society and the Harvard Institute of Exploration, 1938.

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The outward forms the inward man reveal —OLIVER WENDELL HOLMES

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31 CHEMICALS helped make that shirt!

And those chemicals—plus many others—bring you brand-new fabrics of finest quality. They create new color effects and radiant "combination" tones and patterns in modern clothing . . . rugs . . . draperies . . . blankets.

These better fabrics are made possible by *better materials.*

Chemically made fibers, for example, that challenge nature's best in wear and appearance. Better chemicals, too, in wetting agents...shrink-proofing treatments...solvents for dyes...and other "musts" of modern textile manufacturing.

Also in the picture are stainless steels for dyeing vats that are easy to clean and resistant to corrosive acids and alkalies. Plastics for bobbins, pins, levers, control handles and for many another tool part. And even such *new and better materials* as synthetic sapphire for the thousands of thread guides on huge textile machines.

Producing these better materials and many others —for the use of science and industry and the benefit of mankind—is the work of the people of UNION CARBIDE.

FREE: *You are invited to send for the illustrated booklet, "Products and Processes," which describes the ways in which industry uses UCC's Alloys, Carbons, Chemicals, Gases and Plastics.*

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1. A day's dishes done like magic! The G-E Dishwasher will wash a whole day's dishes for a family of four at one time. Separate racks hold china, glasses, silver safely. Dishwasher takes pots and pans, too!

2. No more rough, red hands! You never touch dishwater. Just turn the switch and the Dishwasher takes over —*automatically* washing and rinsing dishes in water hotter than hands can stand.

3. Gives you new hours of freedom! You're no longer a slave to a dishpan. The Dishwasher hygienically cleans and rinses each piece *cleaner than by hand*. Safely, too — only the water moves.

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FOR THE COMPLETE TABLE-TO-SHELF DISH JOB

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It's Full-formed Sculpture...

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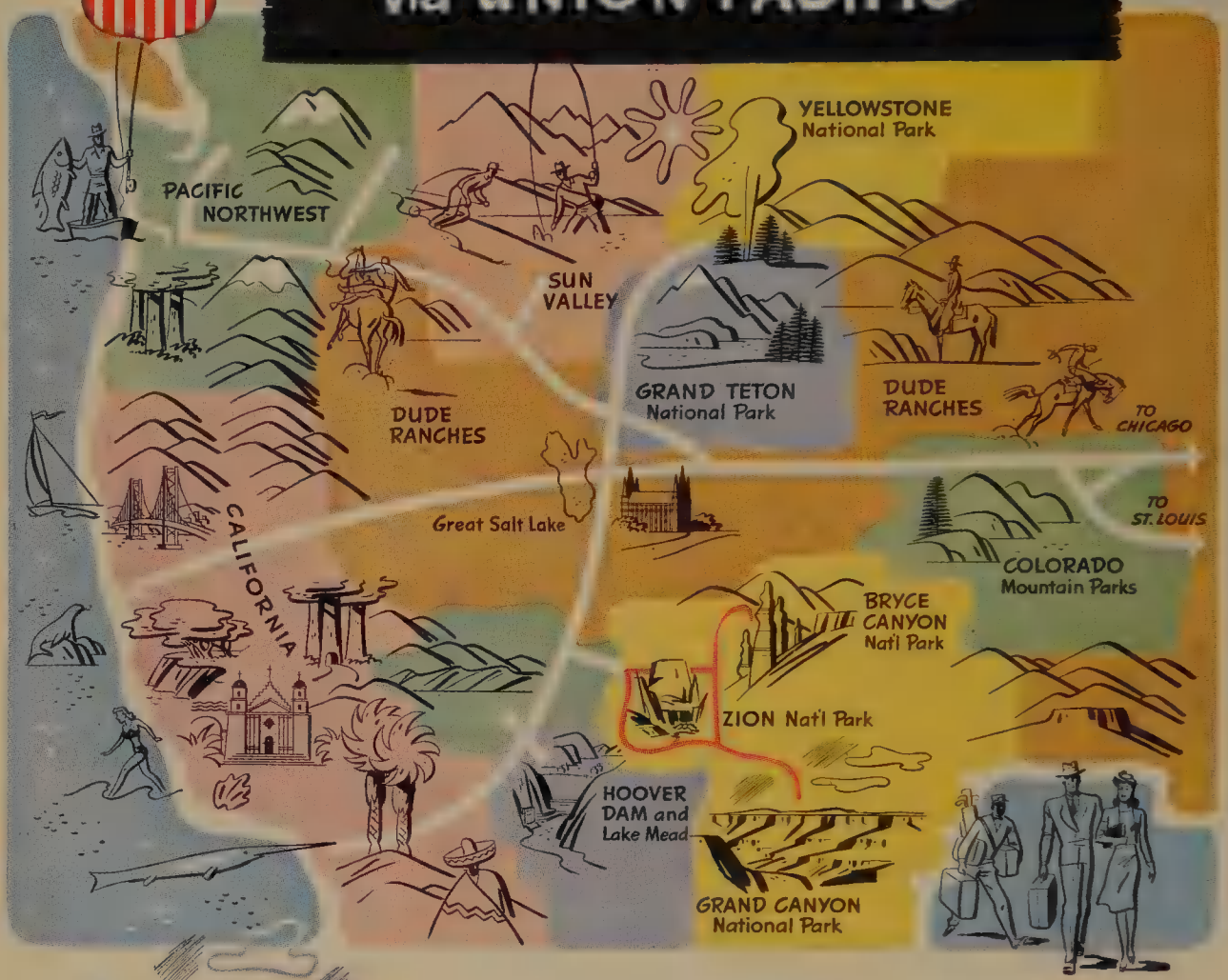

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New Zenith Chippendale, mahogany console radio-phonograph. Shown closed above and open at right. Cobra Tone Arm; new INTERMIX Silent-Speed Record Changer—handles 10 and 12 inch records together; Standard Broadcast; Zenith-Armstrong FM; International Short Wave; Radiorgan Tone Control; Concert Grand Speaker; Wavemagnet. Model 12H092R. **$425***

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These new cars—and the locomotives, the improvements to track and signals and shops and all the rest of the railroad plant — call for an investment of more than a billion dollars a year.

That's one reason why railroad rates have to be enough so that railroad earnings will be adequate to attract investment dollars. For the railroads of *tomorrow*, and the service you will get from them, depend upon earnings *today*.

Association of American Railroads

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"Back home, I teach history—but I'm always ready to learn some. Where can I do that better than in Britain? Your local color isn't simply on the surface. Here, every lane and field and hillside has seen history in the making for 2000 years.

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"Yes, we'll take back lots of happy pictures of this country. From our cameras—and in our hearts."

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THRILLING EVENTS IN 1948

MARCH: Ski-racing, Scotland—13th-14th • Rugby—Scotland vs England—20th • Oxford-Cambridge Boat Race—24th • Children's Royal Academy—30th (till April 19th) • Racing—The Grand National Steeplechase.

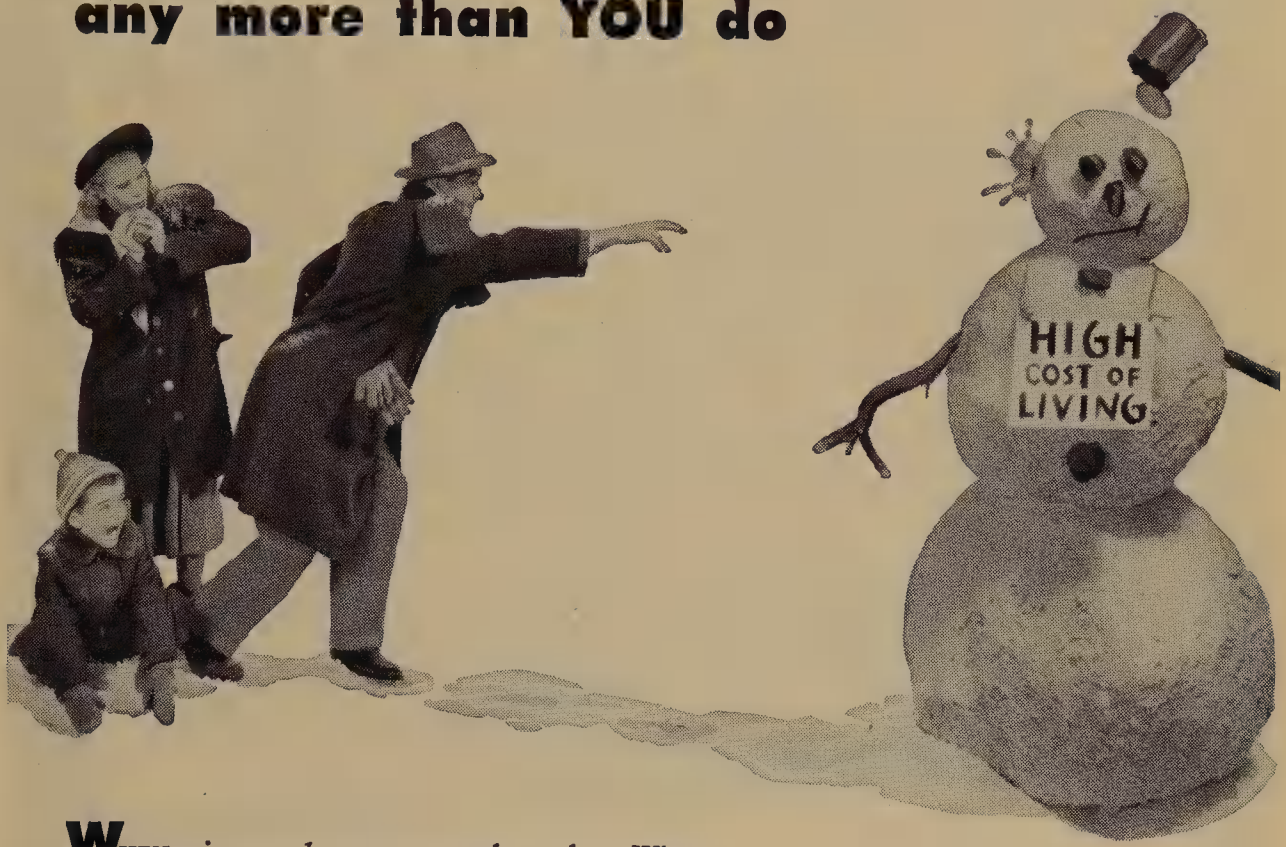
APRIL: Shakespeare Festival—15th(till October 2nd) • Centenary Industrial Exhibition, Wolverhampton—17th-24th • Bath Assembly—21st (till May 1st) • Shakespeare Birthday Celebrations—23rd • Football Association Cup Final—24th.

MAY: Exhibition—Royal Academy Summer Art—1st (till August 8th) • British Industries Fair—3rd-14th • Royal Windsor Horse Show—13th-15th • Golf—Ladies' International Match (Curtis Cup), Southport—22nd • Chelsea Flower Show—26th-28th.

JUNE: London Music Festival • Racing, The Derby, The Oaks—1st-4th • Royal Horse Show—10th-12th • Antique Dealers' Fair—10th-25th • Racing—Royal Ascot—15th-18th • Pageant, St. Albans—21st-26th • Lawn Tennis Championships—21st (till July 3rd).

Many additional events and celebrations are scheduled for these four months alone. Your Travel Agent can furnish further details.

We don't like the high cost of living any more than YOU do



WHEN prices are *low*, more people can buy. When prices are *high*, fewer people can afford to buy. That's as bad for us as it is for you. So we're always looking for increased *efficiency* as well as improved *products*.

Every month the ablest men from all our companies sit down at a table to pool their brains and experience. The first question always is, "How can we keep quality *up* . . . and prices *down?*"

Here are some figures which show how milk prices compare with food prices, from 1939 to 1947:

Increase in cost of food 106%
Increase in cost of fluid milk 63%

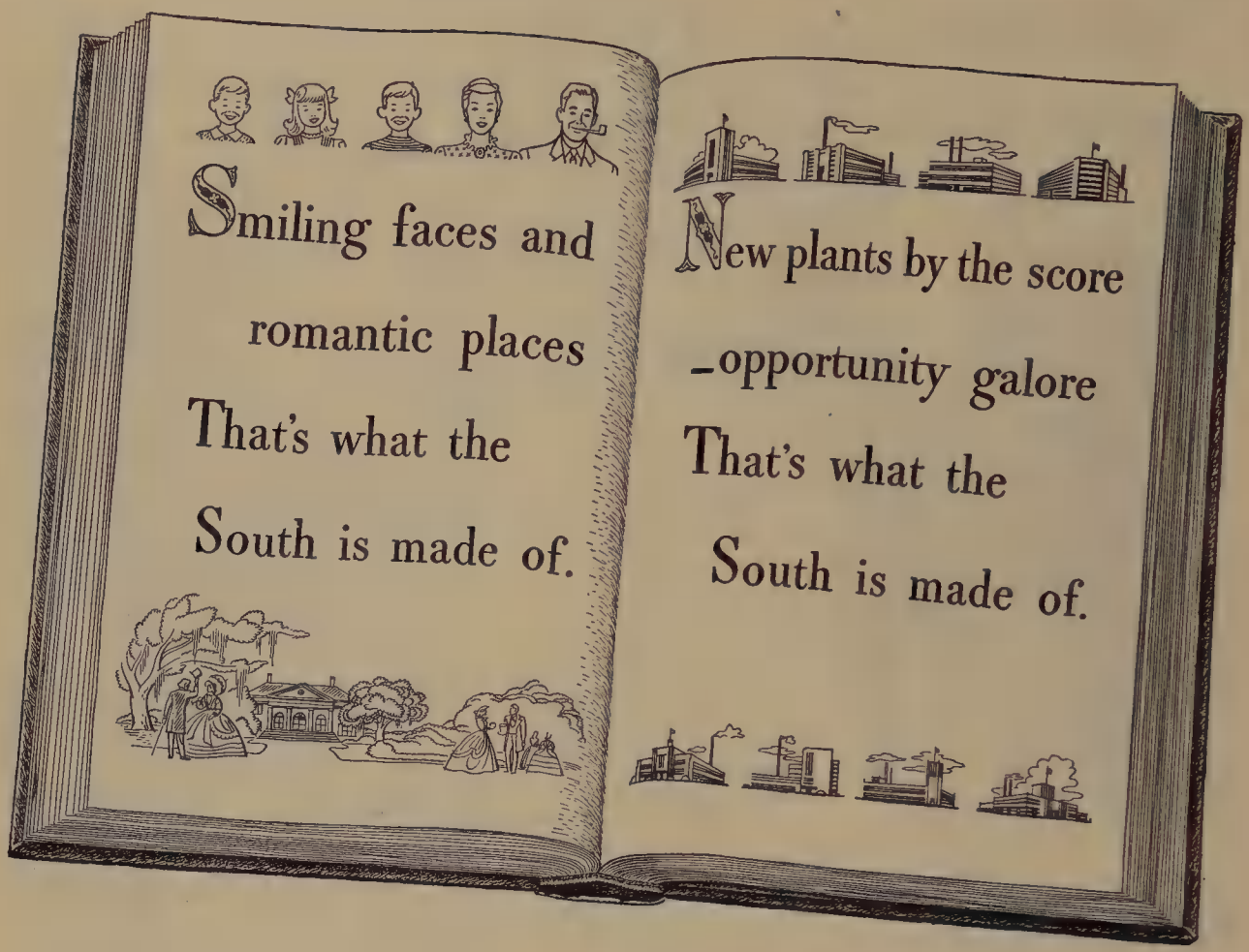
Notice that milk has not increased nearly so much as the average of other foods. Our profit from all of our milk divisions averaged less than ½ cent per quart of milk sold in 1947—far less than the public thinks business makes—and much less than the average profit in the food industry.

Milk, nature's most nearly perfect food, gives you more for your money than anything else you can eat. It's our job to see that milk—and cheese, butter, ice cream and other products made from milk—are fine and pure. *And that they are available at the lowest possible prices to the largest number of people.*

An impartial national survey shows that most Americans consider 10%-15% on sales a fair profit for business. Compared to this, the average profit in the food industry is less than 5%. And National Dairy's profit in its milk divisions in 1947 was less than 2%.

Kraft · Sealtest · Breyers

NATIONAL DAIRY
PRODUCTS CORPORATION



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Just travel along the 8,000-mile Southern Railway System. You'll think you're living in a fairyland—historic shrines, charming scenes and friendly people.

Then presto chango! You see thousands of factories, big and small, growing like Jack's beanstalk . . . and prospering because they have resources, markets and more natural gifts than Aladdin's lamp could ever bring them.

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"Look Ahead—Look South!"

Ernest E. Norris

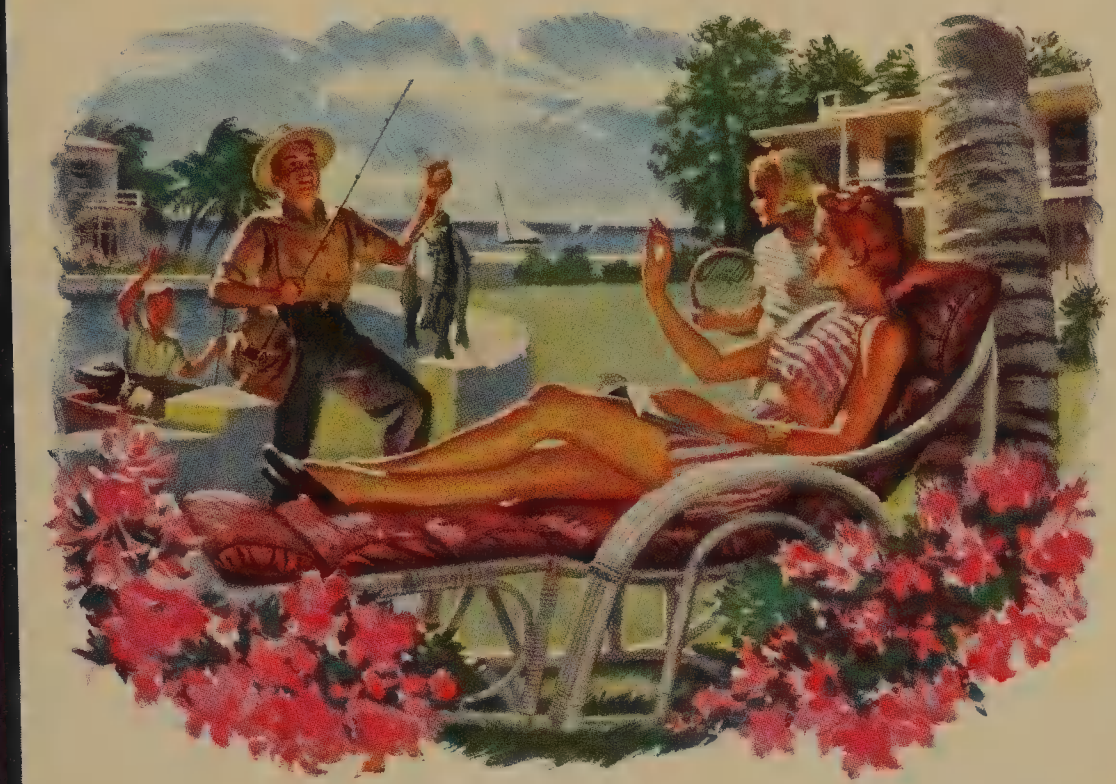
President

LOOK SOUTH LOOK AHEAD

SOUTHERN RAILWAY SYSTEM

The Southern Serves the South

"WE'VE FOUND THE RECIPE FOR HAPPIER LIVING"



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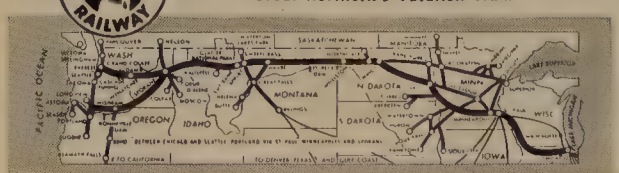

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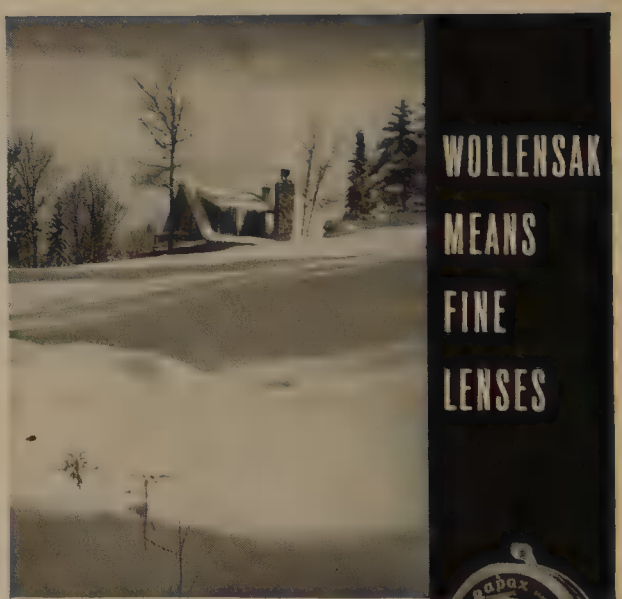

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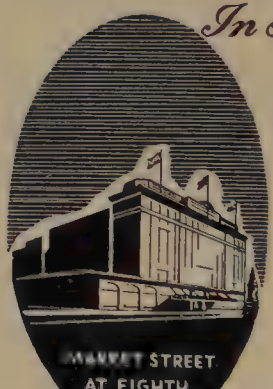

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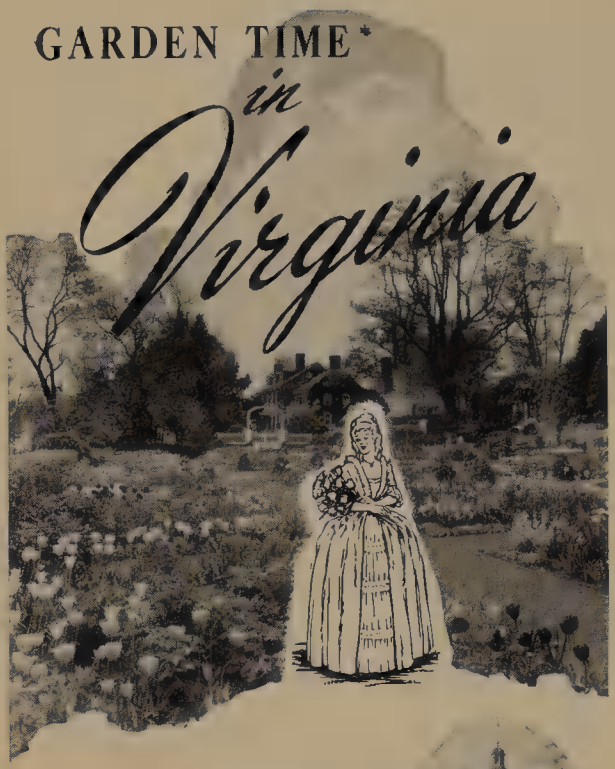

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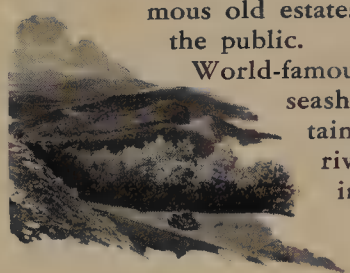

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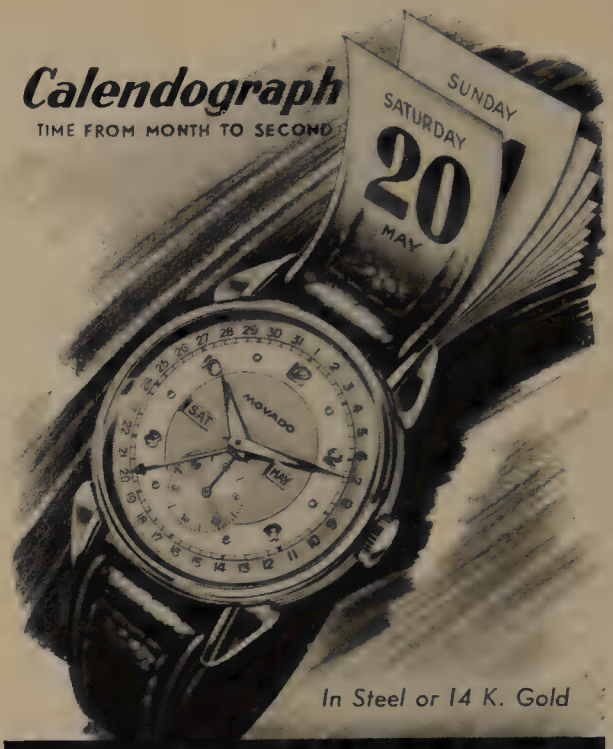

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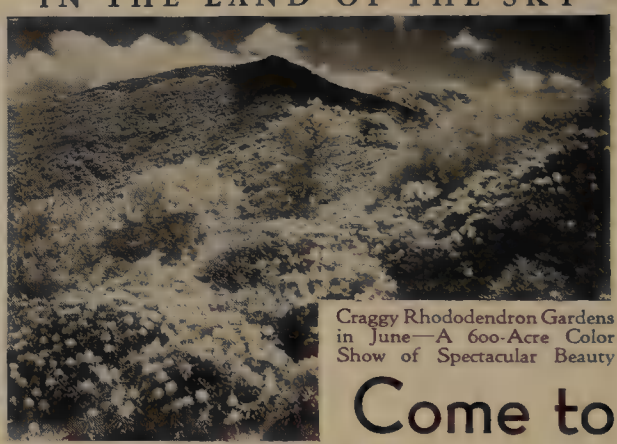

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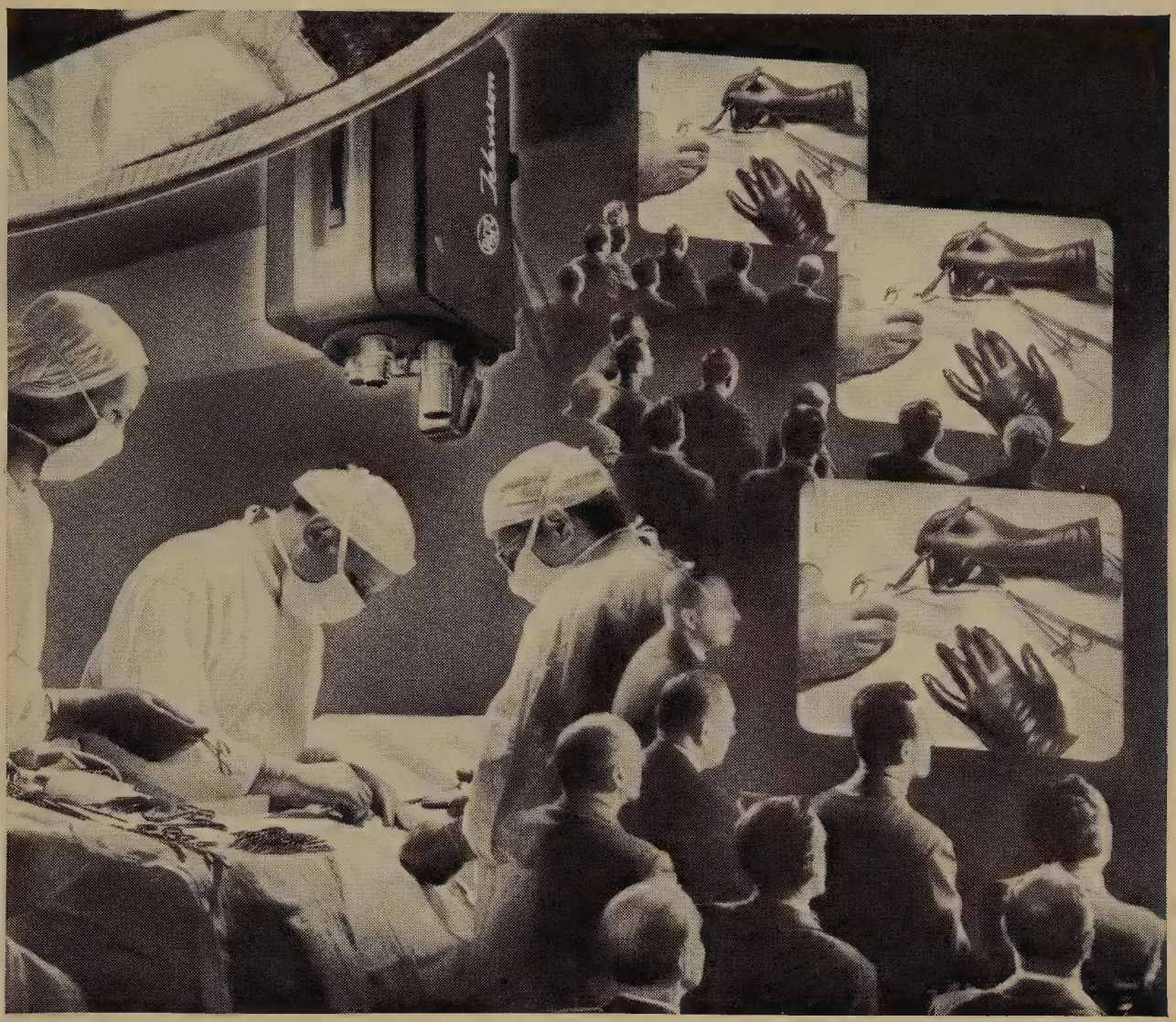

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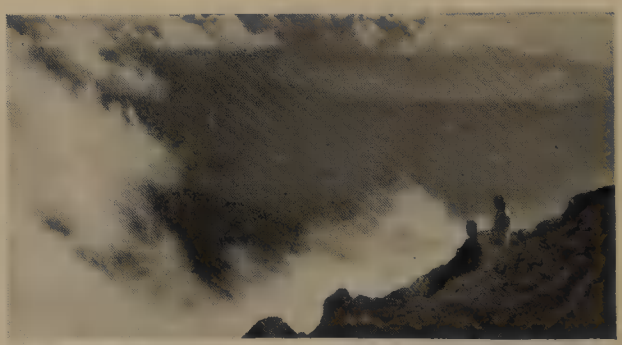

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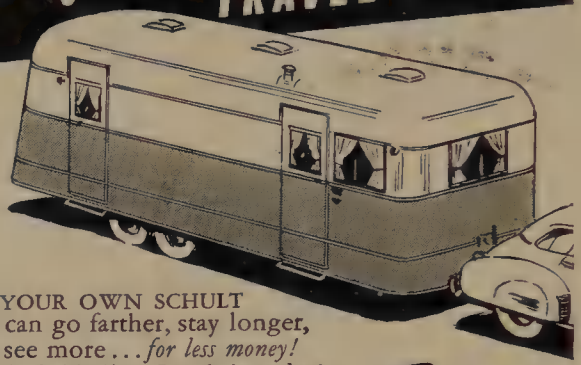

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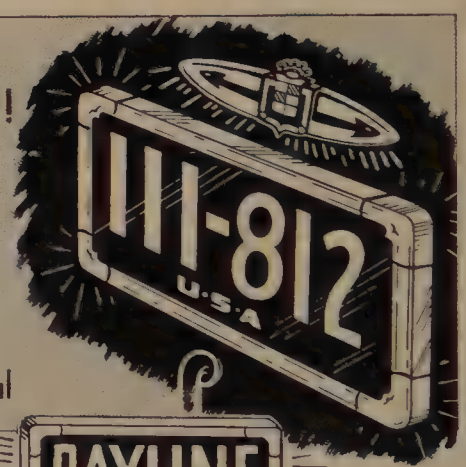

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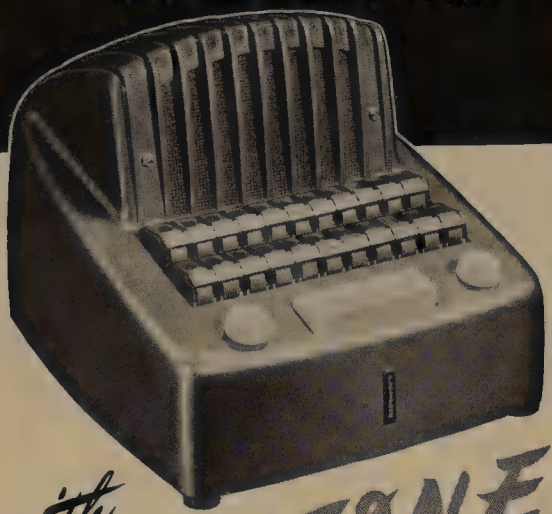

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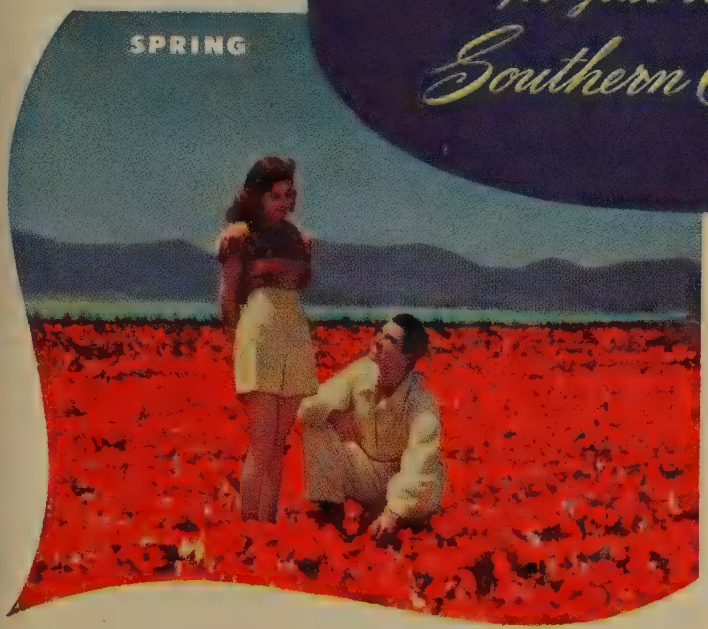

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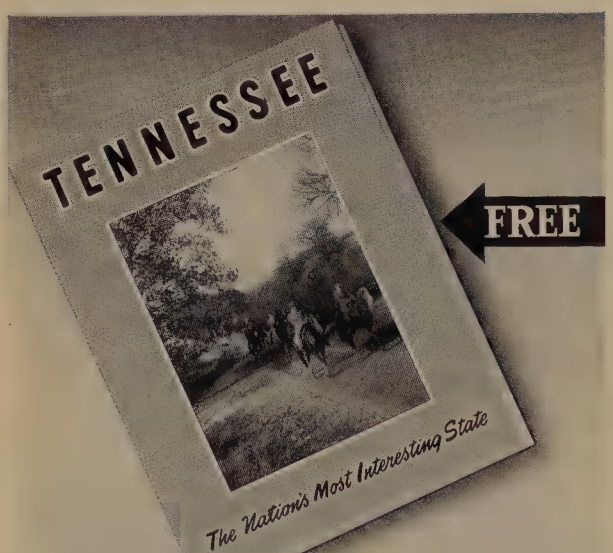

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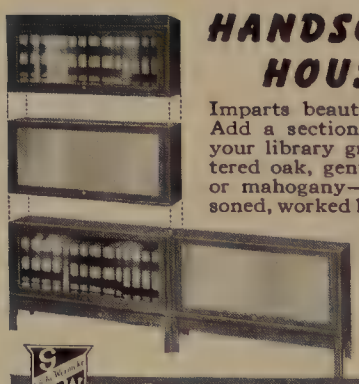

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Polident comes in two sizes—regular and large economy size—available at all drugstores. It costs only about a cent a day to use, so get a can of Polident tomorrow, sure.

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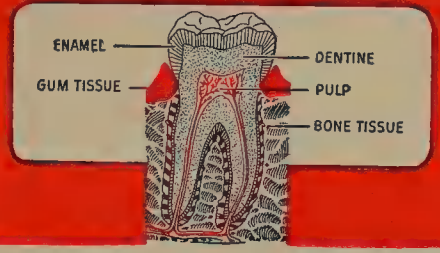
RECOMMENDED BY MORE DENTISTS THAN ANY OTHER DENTURE CLEANSER

Your teeth look like this



When decay starts, it eats through the hard enamel and spreads into the softer dentine. Unless checked, this infection reaches the pulp chamber from which it may enter the blood stream causing damage in other parts of the body.

Periodic examination, cleaning, and treatment of teeth by your dentist can usually check decay before serious damage occurs.

Gums must also be guarded. Bleeding gums, pyorrhea, and trench mouth can indicate infection. *See your dentist regularly to help safeguard your health!*

GOOD TEETH DESERVE GOOD CARE

Don't wait for pain to drive you to the dentist. Visit him every six months, or at such intervals as he suggests.

The dentist's examination, aided when necessary by the X-ray, usually can detect hidden trouble such as abscesses at the roots of apparently healthy teeth. Prompt treatment can generally correct the condition before it may impair your health.

For further helpful information on teeth and gums, send for Metropolitan's Free Booklet, 38-N, "Good Teeth."

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TO VETERANS—IF YOU HAVE NATIONAL SERVICE LIFE INSURANCE—KEEP IT!

How a dead tapir kept Orellana's men alive

THE 57 Spaniards who sailed with Francisco de Orellana down the Amazon in 1542—the first white men to cross South America—started their perilous voyage on empty stomachs.

Orellana expected friendly natives to furnish food. But instead, the Spaniards were met by well-armed war parties. Every time they dared to land to get a square meal, they had a stiff fight.

By late summer, after eight months of hardship and thousands of harrowing miles, the men were too sick and weak to fight longer for their food. Adrift near the mouth of the Amazon, starvation stared them in the face.

Then, one evening at dusk, a lookout sighted a dim shape floating on the water. A canoeman, sent to investigate, brought back—to the amazement of all the men—a dead tapir, enough meat to feed them all for days.

By miraculous good luck, Orellana's men were saved from starvation.

Today, the good luck that saved Orellana's men is still the exception, not the rule. And the average man, particularly if he has a family, dares not lean on his luck when the going gets tough. Instead, if he is wise, he depends on the certain, sure protection of modern insurance to guard his family from financial hardship—now and for the future. It's as simple as this:

By investing in accident and life insurance a small fraction of what you earn now, you can make sure that those who depend on your income will have money for what they need, no matter if mishaps or death befall you.

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VOL. XCIII, No. 3 WASHINGTON MARCH, 1948

THE NATIONAL GEOGRAPHIC MAGAZINE

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The Wonder City That Moves by Night

By Francis Beverly Kelley

SPANGLED and big and red and gold, the circus smells of peanuts and cotton candy and pink lemonade and wild animals. It is as American as hot dogs.

It pops up some gray morning with its billowing tents and flags whipping the halyards on a horizon that wasn't there a few hours ago. With sights and sounds to quicken the heartbeat, it makes its visitors kin to Alice at the moment when she stepped through the looking glass into the realm of pure fantasy (Plates XII and XIII).

Here today and gone tomorrow, it is a state of restless American achievement, a pioneer peddler with magic in its pack and a timetable in its pocket—a spangled, sparkling girl with a date in a town a hundred miles away tomorrow morning.

Descendant of the Roman Circus

Patterns of this amusement colossus stem from ancient times, and yet reflect the format of the Roman Circus Maximus with its races and physical prowess and wild beasts, but the restless mobility and fabulous immensity of "the biggest thing on wheels" is American.

Circuses in other lands have excellent talent, but they lack the frantic schedule of a new-town-nearly-every-day and the energy to move a four-train, 100-car show over the map for seven or eight months.

There are only two days in circus business: today and tomorrow. Always the course of the show's bloodstream lies a hundred or so miles ahead where cheerfully and competently it will repeat today's routine. Only the name of the town, the weather, and the spectators will alter the mammoth animated mural which is circus day in America.

The people who see the huge presentation in Madison Square Garden in New York City, traditional opening stand of the Ringling Bros and Barnum & Bailey Circus, refuse to believe that the show can be taken on tour in its entirety, and the spectators in small cities are hard to convince that they are seeing the same performance that folk in Manhattan paid a higher price to see.

Disbelief in the magnitude and the mobility of the circus exists even among some of its own people—performers newly recruited from the European outdoor shows and music halls. Although they exhibit in the same tents in each successive town, they remain skeptical for the first few stands.

Every year millions of people watch the circus come in, some of them up at the first streak of dawn to see the big wagons rolled off the flatcars in the railroad yards, the tents spread and raised, and the vacant lot of a few hours ago transformed into a tented town.

The show is self-sufficient except for needing to attach hose and rent water from the city mains and to buy groceries from local supply houses for its hundreds of people and its animals. It carries its own light plants, medical department, postman, blacksmith shop, restaurant, barber shop, harness shop, metal shop. In a cold-storage wagon it even has an emergency supply of canned goods and meats to cope with a possible failure of local deliveries.

Change of Towns Fools Even the Dog

A circus can cover but about 150 towns a tour. The few communities not getting one of the big railroad shows see motorized or "mud" shows, so dubbed because they travel overland instead of on the railroad.

The fact that the circus looks much the same whether it is encamped on a muddy lot in Portland, Maine, or on a sandy flat in

Lawrence D. Thornton from Three Lions

Crawling under the Tent Is a Supreme Thrill of Childhood

Some youngsters would trade a seat in the center grandstand for a risky peep into the mysteries behind the canvas wall. Of course there is little chance of "sneaking in for free," but it is fun to try.

Florida fooled even the pet dog belonging to the circus treasurer. The dog hung around the office wagon, which always is spotted in the same position every day in relation to the other units on the midway—the side show, lunch and novelty stands, main entrance, etc.

Every day the little dog would find a delicious bone and bury it with true trouper frugality under the office wagon. Then in the next town he'd try to dig it up again!

During the war the circus never lost a stand, although it bowed to an order asking that it not venture into the far West with its four trains and thus add another railroad problem to that area. It sold through special performances more than $100,000,000 worth of war bonds, and it wore its war paint on the faces of its clowns, who visited hospitals and participated in patriotic drives in their spare moments.

The circus draws its people, as well as its animals, from all over the world. In 1947 John Ringling North went all-out for importation of acts, with the result that last year the show had more than 40 acts appearing in America for the first time. Many nationalities, creeds, and colors traveled with the "Greatest Show on Earth" and, except for occasional personal disputes, got along famously and made new friends.

Foreign Performers Taught English

Harry Dann, a St. Louis boy who ran away from his father's banking business to become a clown (Plate XX), taught English to the children who were traveling with their European and Asiatic parents. These new troupers saw a lot of the United States at first hand and in a hurry as the show moved along.

The circus is animals, wild and domestic, and all so acclimated to the ambulatory life that Dr. William M. Mann, Director of the National Zoological Park in Washington, D. C., has a theory that some traveling circus

animals are as easy to keep in good health as beasts limited to the sights and sounds of one place.

Diets of circus animals are important, and animal men argue interminably as to whether horse meat or beef is better for the big cats. The Ringling-Barnum-Bailey outfit always fed lean, second-cut beef until the advent of World War II when it switched to horse meat, and it never has gone back to beef.

Rationing Hit the Menagerie, Too

Rationing is difficult to explain to a gorilla. But the bride-in-name-only of Gargantua, Toto by name, raised in luxury and taught to eat filet mignons on the palatial Habana estate of Mrs. E. Kenneth Hoyt, had to forget all this and become used to a vegetarian diet again, the gorillas' natural food.

Zoologists who study comparative animal intelligence always start with the chimpanzee. They usually place the orangutan in second place, and follow with the elephant, but they reserve a flexible position for the gorilla because so few have lived to any considerable age in captivity or have been studied as intensively as chimpanzees. Their innate savagery also limits the chances of gaining more knowledge of them.

Until an air-conditioned cage was constructed by the master wagon craftsman, Bill Yeske, for Gargantua, the Ringlings lost three gorillas at an early age, soon after their circus career had begun. Gargantua has been a circus gorilla for a decade now and, except for illnesses which might be expected in that span of time, has thrived in captivity.*

There are several other gorillas in the United States, but Gargantua, one of the biggest and most savage, is a personality; he has captured the imagination of the public; he has had circus publicity men at his beck and call since 1938 (page 293).

Everything he does is news. In winter quarters in 1938 he tried to murder his keeper, Richard Kroener. This incident occurred when the man stood too near a temporary cage in which the gorilla had been placed while his air-conditioned cell-block-on-wheels was in construction.

Kroener knew the gorilla's arm reach was six feet, and he kept six feet from the cage. One day, however, as he reached up with his boat hook and opened the window near the roof of the little building that housed the gorilla cage, a hairy paw encircled his free arm and lifted him as if he had been a pygmy.

Gargantua had spread the bars of the temporary cage enough to permit his shoulder as well as his six-foot arm to go through. Pressed savagely against the steel bars, squeezed breathless, and painfully bitten, Kroener beat the gorilla on the head with the pole until the murderous ape dropped him to fight the weapon.

When Gargantua got pneumonia and nearly died during a New York City engagement, several tanks of oxygen released in his cage, large doses of sulfa drugs, and four bottles of citrate of magnesia (the medicine given in his food) saved him.

Gargy is strictly a wrong-side-of-the-track guy. He grew from babyhood in New York's back yard across the East River. Brought to a private zoo there as a tot, he finally became so big and so savage that his owner was glad to sell him to the circus. Promptly Henry Ringling North changed the gorilla's moniker from "Buddy" to "Gargantua."

Gargy eats seven or eight times a day. Beginning with a quart of milkshake into which has been mixed liver extract, he later devours a dozen apples, oranges, bananas, a basket of lettuce, carrots, and other vegetables, some dark bread, and a pound of broiled liver.

Sometimes the elephants beg for the lettuce and carrot scraps that are swept from his "table," but, once they get the scent of the gorilla, they refuse it and even stamp on the food. These are Asiatic elephants, strangers to African animals, including the gorilla.

The increasing savagery of this gorilla runs true to form in all the great apes as they grow older. Even chimpanzees and orangutans are dangerous as they add years and size, and most of the monkey family follow the same course of temperament.

Gargantua Is Hard on Blankets

At night, Gargantua rolls up in a cheap cotton blanket, which he rips to shreds next morning. The circus-blanket mortality is high, but there is no curing the gorilla of this habit. It seems deep-seated in his jungle ancestry, where these large apes of equatorial Africa make their nests usually at the base of vine-draped trees and quit them in the morning, apparently never sleeping twice in the same place.

Gargantua gives evidence that he hates mankind with a consuming passion, but he did learn to like his first keeper, Kroener, after a fashion. He still looks for Kroener, but he looks in vain, for the pleasant, warm-hearted little man who raised the "terror" died from natural causes several years ago.

People believe that sea lions are born

* See "Man's Closest Counterparts," by William M. Mann, NATIONAL GEOGRAPHIC MAGAZINE, August, 1940.

equilibrists; yet they require more patience and skill in educating than any other circus performer. In fact, these prima donnas of the big top are so temperamental that the trainer must be careful even not to scold them; they may pout for a week and refuse to do their tricks! But they like their work and are as applause-conscious as any Broadway actor.

Roland Tiebor, sea-lion authority, had a faithful performer named Sparky. Sparky got old and stiff, but insisted on keeping up his work in the ring. He would even gallop in and push aside newer sea lions which had been taught to do some of his old routine.

Sparky Was a True Trouper

While the Tiebor act was on tour in theaters during the winter months, Sparky could find his way from the dressing rooms to the stage unfailingly, often through labyrinthlike passages; yet Sparky was stone-blind.

Animals often are trained in foreign languages and have to learn almost literally to translate their instructions. If they have been trained in German cues, and then wind up with an American circus, their trainers must patiently say the English equivalent of each German command until the animal actor learns his new language.

Of course animals can be trained to respond to surreptitious movements of a trainer's hands or to some slight shift of his body as well as to spoken command, and the silent cue is the more mysterious, especially if used in an act which implies that a pony can perhaps count or read.

Circus keepers learn to love their animals, and often a man whose charge has died will be so lonely that he will leave the show.

Babies always cause excitement in the realm of the big top. When circus veterinarian J. Y. Henderson had to find a wet nurse for three baby leopards their mother refused to accept, a cat was the first choice; but after a few days the requirements of the young savages exceeded the capacity of tabby. A canine mongrel named Spot came to the rescue and raised the leopards until they could be weaned.

Elephants seldom are born in captivity, and not more than seven have been foaled in this country since the first "ponderous pachyderm" arrived at Salem, Massachusetts, in 1796. None lived a year, and the demise invariably was blamed on bad diet. The mothers didn't nurse them, and baby formulas had not then reached the standards which some animal men today believe might be the answer to the baby elephant problem.

Imported from Asia or Africa at an early age, circus elephants are as a rule strangers to peanuts until they learn to like the goobers of this country.*

Naturally healthy, circus elephants nevertheless are difficult patients when ill. They detect medicine in food and refuse it. They chill easily, having a slow circulation and a heartbeat of but 28 to the minute when standing and 35 when lying down.

The elephant's trunk is its nose. Into it water may be sucked part way and then squirted into the mouth. Water is not swallowed through the trunk, as many spectators conclude erroneously.

Elephants are shaved with a blowtorch. The flame does not burn their skins; it merely tickles and thus pleases them.

The skin is thick but sensitive, and insects bother the great beasts in hot weather. Dirt thrown on their backs helps keep off the pests.

While the wild-animal acts dealing with big cats, especially with mixtures of lions and tigers, will call out all the courage and perspicacity a man or woman can command, the playful-looking bear is the most dangerous.

"Never make a pet out of a bear; he'll be cute as a baby and a murderer when he grows up," is the admonition of the people who risk their lives in the steel arena.

All circus cubs are apt to be pampered and so completely familiarized with mankind that they lose all fear of the trainer and attack him confidently when grown. Jungle-bred cats are the preference of most trainers.

Ruth the Elephant Always "Cute"

On a lot in Atlanta in late October, one of the best of elephant troupers, Ruth, goes placidly about minding her own business. This consists of pushing wagons, hauling heavy equipment, and serving as the power for the block-and-tackle raising of the huge big-top center poles.

She wiggles and executes intricate little dance steps. She knows she's cute. She packs more interest wallop for the customers when she is working in harness with her glamour down than she does when she's dolled up for the grand entry. Here in the morning, hard at work, Ruth is the circus elephant equivalent of America's housewife at work in her kitchen, and she has innate showmanship enough to know that she is a pleasant sight to behold.

Between tasks she delights the crowd by nudging a little girl whose hand tightly clasps a bag of peanuts, pulling up little tufts of grass, getting herself a drink by turning the

* See "Nature's Most Amazing Mammal," by Edmund Heller, National Geographic Magazine, June, 1934.

spigot on a water truck. All this in the absence of her keeper, who is busy elsewhere at the moment. The behavior of the big show's elephant herd leader epitomizes the confidence and dispatch with which all members of the circus family go about their tasks.

The circus is color—a wild, kaleidoscopic whirl of color in the course of a two-and-a-half-hour performance, and color is an integral part of its whole existence.

Circus Signboards Signs of Spring

Bright ribbons in the coiffure of springtime are the brilliant pictures of snarling wild animals, tumbling acrobats, pretty circus girls, and laughing clowns that quicken the pulse of kids from eight to eighty. These are the trumpet notes of spring expressed in color; and yet the men who bring about this magic on barns and fences and in store windows act so inconspicuously that their "art work" seems to have been executed by sheer magic.

Burnell

Gargantua Hates the Human Race

Though the giant gorilla has been with the circus for ten years, he is still an untamed savage (page 291). In the opinion of "Bring-'em-back-alive" Frank Buck, the brute has the strength of 20 men; he demonstrated his prowess by jerking 17 off their feet with one hand in a tug of war.

They wear no spangles, the knights of the bucket and brush; yet some of the chances they take on the lashlines and lofty ladders while tacking banners to tall brick buildings are as hazardous as the work the acrobats and aerialists do under the big top.

They take a mouthful of big tacks, the kind that number less than 200 to the pound, and spit them at magnetized hammers. They drive them through their thumbs if they are careless and inevitably they swallow some big tacks. The remedy for such a gastronomical catastrophe is to eat the inside of a loaf of white bread and keep calm.

Circus billing has become increasingly difficult in recent years because of the decrease in locations and the reluctance of some property owners to have the hard-to-get-off posters on their buildings.

A favorite sales argument among billposters is to imply that they have miraculous "30-day paste" that disappears in a month and permits the posters to fall off by themselves, and that they use "chemically treated tacks" that disintegrate after a time.

Poster Fights Now Tame

There still are some opposition fights among billposters, but not on the grand scale that once made a circus season a series of near-lethal engagements between the rival billers. Today, there are not so many circuses on

the road. Billposters battled it out with brushes, buckets, clubs, and whatever was handy in the "good old days" before the boys woke up one fine morning in 1929 to learn that John Ringling had bought out all his major competitors and that, henceforth, the billers would have much less reason to fight each other.

Tricks in Billposting

All was fair in circus war. A favorite sabotage was to sneak yeast into the paste barrels of the enemy billposter. Soap was even better, because its presence would not be detected. The posters would stick to the buildings and fences, but when they were dry, long after the men had gone, they would peel off.

Show owners usually took an opposition whipping good-naturedly, often taking the long, sagacious view and trying to hire the very men who had bested them.

But when two rival crews hit town together and tangled, no holds were barred. Men were taught to beat their antagonists on arms and shoulders with hickory-handled brushes. This was not so much to save their heads as to cripple their arms so that they couldn't post bills the next day.

During the war the Big Show's posters carried war-bond stickers. In response to requests by the USO for circus posters with which to brighten canteen huts of the Aleutians and the South Pacific and Africa, the circus put date strips on the posters so that they read: "COMING SOON . . . TO TOKYO AND BERLIN!"

Circus Folk Come from Everywhere

Circus people come from all countries and from all over the world. According to circus personnel boss, Pat Valdo, the best American circus girls come from farms. They are healthy, pretty; they like animals and are used to being out-of-doors and don't expect circus life to be easy.

Even in the best of the big shows, it's mud and rain and intense heat and cold and hardship in general. That part of outdoor show business hasn't changed much in a hundred years.

Some of the most interesting people are employed in the circus side shows (Plate XIV), and for many of them, deformed or otherwise misfitted for life in a so-called normal world, the existence of anything so bizarre as a circus museum for human curiosities is a fortunate haven.

There they belong; there they are not misfits; there they are paid and feel useful, and make their friends, and live in a gay, wonderful world where their very abnormalities are considered something of an asset.

Most circus freaks are married; a famous bearded lady had several husbands in her colorful career. Today, the circus world has no exponent of this branch of freakdom, so far as I know, although Fred Smythe, Ringling's side-show boss, says he gets letters from women (mostly in Los Angeles) who claim they can grow a good beard if he will guarantee employment.

Sword Swallowing Is Easy

Anybody can learn to swallow a sword—anybody, that is, with the patience and the inclination. It is a matter of tilting the head back so that the esophagus is in a straight line. The instruments are not very sharp.

Swallowing a lighted neon tube is the most spectacular trick in this category, but unusually dangerous. The glass tube is apt to shatter without warning and kill the performer, but the fact that spectators can see the lighted tube clearly inside the throat makes this demonstration what circus side-show entertainers call a "natural."

Long before the days of recorded music and radio broadcasts circus bands played the best music heard by people over large areas of the country. Circus costumes were sheer magic to the outlying districts and circus animals a firsthand zoology lesson. Its Ubangi savages with the saucer lips and the Burmese women with necks elongated by the application of brass rings from early childhood were anthropological oddities.

A recent disappointment occurred when one of circusdom's chief jungle scouts, Howard Y. Bary, discovered that the widely heralded Watussi savages used an anthill or a similar small mound for a take-off when accomplishing their seven-foot jumping feats.

Of course danger and appeal-to-customer go hand in hand under the big top. A present-day campaign to compel use of nets under all aerial presentations is not likely to get anywhere.

Traditionally, the only aerial acts that use nets are the flying trapeze or casting presentations, during which people actually leave all rigging and hands of partners and momentarily "fly" free of such protection. Frequently they drop into the "safety net," which is safe in name only unless the performer knows how to land in it. They try to hit the net on their backs or heels. Many a neck has been broken by a wrong fall, and falling safely is one of the first things a fledgling circus trapeze performer must learn.

One aerialist, Arthur Concello, bounced

from the net into ownership of a small circus and, presently, to the general manager's post of the Ringling show. Few performers ever become owners or managers.

In more than a decade only one death from an accident has befallen a performer in the case of the biggest circus. By the time a trouper has become skilled enough to appear in the "big time," he probably has reduced hazards to a minimum. The circus doctor has many more patients among the workingmen who handle wagons, seats, props, etc., and can get hurt in a great many ways every day, than among the actors.

Circus daredevils, when they do suffer accident, are apt to meet misfortune while doing an easy trick or maybe none at all. Circusdom's queen of the air, Lillian Leitzel, fell and died when an iron ring in her rigging became crystallized. Fritzi Bartoni fell out of a trapeze while just swinging, and lovely Victoria Torrence fell to her death after the hard part of the act was over.

The Alzanas Survived a Bad Fall

The inimitable Harold Alzana and his sister tumbled from the high-wire in Miami last November while doing what most circus people thought was a comparatively easy trick. Their father, ever present and standing under the rigging, broke their fall—and his neck—but all recovered.

Alzana had another fall, in Marion, Ohio, which illustrates the point of accident due to carelessness rather than to the extreme intrepidity of the act. He had gone aloft to test his cable before the matinee and grabbed a rope to descend hand-over-hand. The rope he grabbed without taking the trouble to examine was loose and not tied off, and it came down as fast as he did. He hit his back on a ring curb, went to a hospital, and was back at work a few days later.

Circus people work long past the age most spectators figure is the probable retirement time. Two years ago, 67-year-old Pop Otari went back into the family aerial act with his three sons and a daughter to replace the boy who had gone to war, as had the other boys in the act, and had been killed on the beaches of Normandy on D Day.

Circus disasters always are spectacular because they take place against a colorful background. The mass death of elephants from arsenic poison, burning of the wild animal menagerie tent, and the terrible fire at Hartford, Connecticut, in 1944, all attracted wide attention.

Yet the miraculous thing about the peripatetic world of red wagons and billowing big tents is that something of this nature doesn't happen more often.

Escape from disaster seldom attracts much attention. If the famed Wallenda troupe of high-wire performers had been injured when thrown from their high perch in Akron some years ago, the world would have known about it promptly, but their good fortune in escaping injury was not news by accepted standards.

The troupe was doing a three-high human pyramid with two men balanced on the slender cable, a pole across their shoulders, and on the pole a chair with a man standing on it and a girl atop his shoulders. It was 10 o'clock at night and outside the big top there was a lot of activity while the show was being loaded.

A four-horse hitch took a wagon past the mud block, an arrangement of stakes where the high-wire was anchored, and caught a spoke in it. It jiggled just enough to upset the Wallendas, and the pyramid collapsed, quietly and completely.

The understanders on the bottom of the group grabbed the wire with arms and legs and hung on. Karl managed to hold on with his hands and swung to grasp Helen, scissor-fashion, between his legs as she fell past him and headed for the ground 35 feet below. Nothing happened beyond this except that, once safely grounded, Helen fainted from strain.

Movie "Greats" from "Big Top"

A not inconsiderable number of movie great claim the land of the big tops for their alma mater, and numerous circus folk have taken "postgrad work" in Celluloid College. Wallace Beery was an elephant shepherd before the movies got him, and Fred Stone was a circus clown in the early days of his career. Will Rogers was a circus cowboy before he punctuated his rope spinning and gum chewing with monologue. Billie Burke was born to the Ringling show in which her daddy was Billy Burke, the clown.

Unlike its sister, the stage, the circus has no callboy to notify the actors when their turn is coming up. Instead, they simply keep one ear tuned to the circus band, which plays the same numbers for the same acts every performance, and thus get into the big top on cue.

Circus music, one of the hardiest of the elements of the big show, has resisted all attempts at fundamental alteration and seems to be going full-blast with brass wide open. True circus fans applaud appreciatively.

The high priest of circus music is the veteran bandmaster Merle Evans, for nearly 29 years leader of the RBB&B band. Evans

has not been off the stand during a two-and-a-half-hour performance year in and year out, always standing up and leading the band with his left hand while tooting a hot cornet in his right. He plays the music he caught hold of as a kid who ran away with a carnival in Columbus, Kansas, and built into a crescendo strong enough to carry him to the bandstand in 1919, the year the combined Barnum & Bailey and Ringling shows made their debut as the "Greatest Show on Earth."

Like the seafaring virtues of the Captain in HMS *Pinafore,* Evans's record of never having left the bandstand during a performance has to be amended to "well, hardly ever."

Once, when ptomaine poisoning struck the troupe in the Nation's Capital and had the circus personnel dropping like autumn leaves all over the lot, Evans did leave the band because of acute nausea. As he stumbled out into the circus backyard toward the dressing tents, he heard the band falter on a high note. He forgot his illness long enough to hurry back and finish the show, a damp towel wrapped around his neck.

Movies, especially talking, natural-color films, and radio entertainment have become great competitors of outdoor show business. They helped wreck vaudeville and Chautauqua entertainment, and almost no circus operators have kept pace with the pull which these present-day mediums have for children.

A lot of circus business has moved indoors, where operators with no physical property such as wagons, tents, and seats to cut down their profits, and no weather to fight firsthand, book a program of circus acts and sell them to organizations such as the Shrine, American Legion, lodges, and church societies.

The warning bell for outdoor shows has sounded in several large cities where the success of these winter auditorium circuses greatly cuts the profit which the traveling outdoor circus may expect in those cities the following summer.

Winter Quarters in Florida

When November paints the Carolina hills with red and gold and late autumn brings chill nights to Dixie, the Greatest Show on Earth packs itself upon its trains and heads for winter quarters in Sarasota, Florida.

It stays there for about four months, preparing for next year's eight-month tour.

Although thousands of Florida visitors are permitted to go through winter quarters, the circus gives no regular exhibitions while acts are rehearsed, new tents made, wagons and floats rebuilt, and the hundred railroad cars go through the shops.

New seats and other equipment are fashioned and everything is repaired. For all performers, animals included, a costly new wardrobe is created.

The circus is goods—76,000 yards of canvas in 1947 for the biggest show on the road. The canvas is new every year and, even though ragged, flameproof at the end of the tour. The flameproofing method was widely used by the United States Army and the Navy during the recent war. The flameproof canvas weighs more than the old canvas, which was merely weather-proofed, but it doesn't soak up so much water. The old canvas used to triple its weight when wet.

Costumes Costly

The circus wardrobe has become an increasingly important item of sales appeal in the last decade, during which the circus has dressed up to meet Broadway (Plate XI). A circus wardrobe boss has a task far and away tougher than the wardrobe mistress of a theatrical show, for the circus does twelve to fourteen performances a week and in all kinds of weather. Ringling's wardrobe chief is a man, Joe J. McCarthy, the first of his sex to do this work, and he has problems unlimited.

More than a thousand costumes for the circus performance—for people and for animals—present a special problem.

Circus styles have changed a great deal through the years, and the old leotards and tights of grandpappy's circus days are now marvels of brevity, but this was inevitable.

Not only in show business but in street clothes and evening attire women wear less and pay more for it. A wardrobe for the biggest circus has cost annually a quarter of a million dollars for at least the last seven years.

Circus women, despite the vagabond character of their lives, lean toward domesticity and they spend much time knitting and sewing. Antoinette Concello, one of the best flying trapeze girls who ever ascended into the vast dome of the big top, once made a costume that barely covered her trim figure but sparkled with 40,000 individual sequins which she had sewed on in her spare time.

As the circus moves over the map, the life of its people who are not engaged in the never-ending task of putting up the tents and other rough work approximates to a large extent that of other people in less spectacular pursuits. They shop uptown and go to the movies when possible, attend church on Sunday, and do a little cooking on the railroad trains after the night show.

The comic threads in the moving mosaic of the circus performance are the clowns. They

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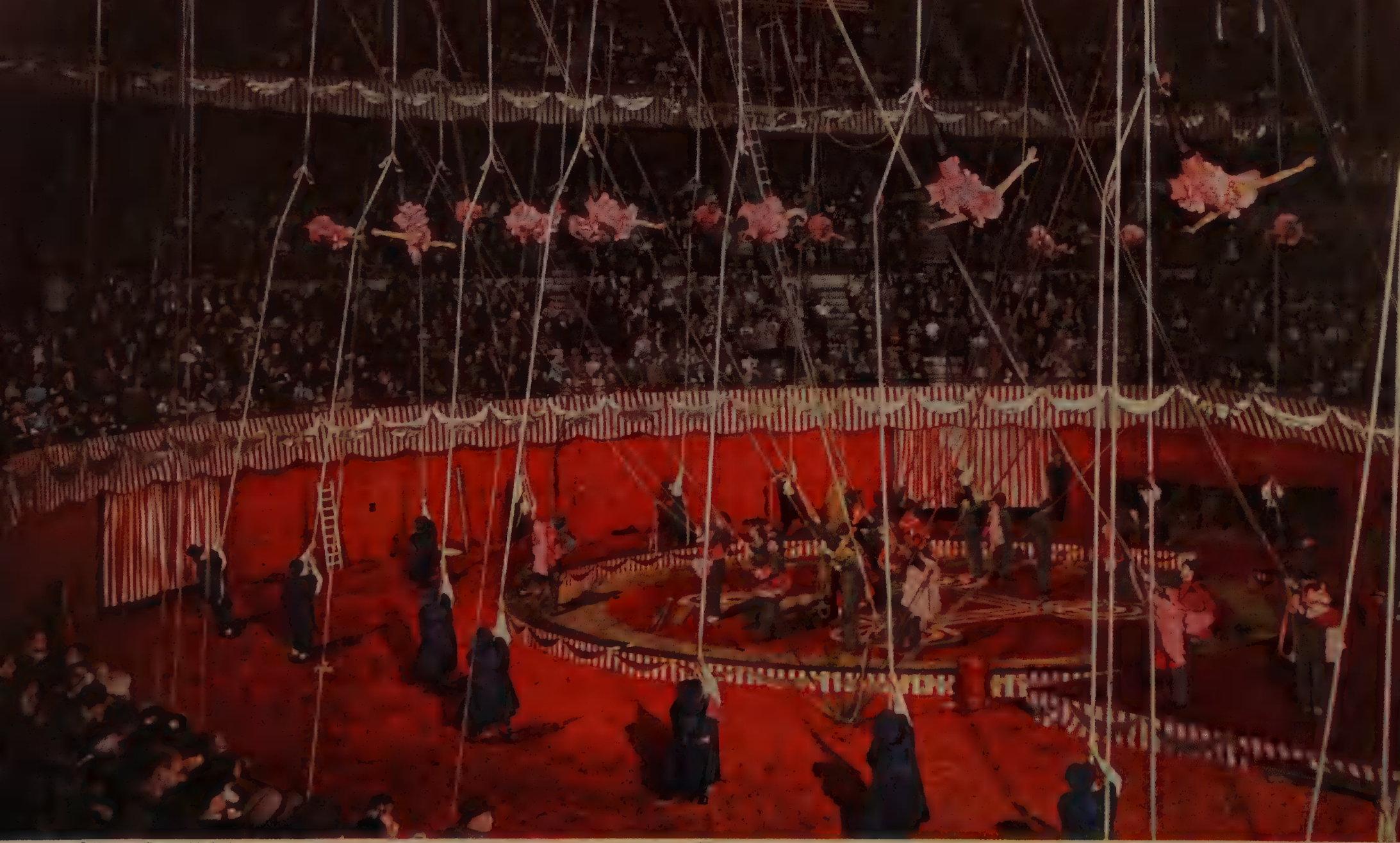
Kodachrome by Harold E. Edgerton

Like a Bolt of Lightning, a High-speed Flash Lights Up Action on the Trapeze

In this newest method of color photography, the brilliant flare reveals faces even in the farthest balcony peering down on the aerialists, the Rose Sisters, of Ringling Bros and Barnum & Bailey Shows. When the camera was snapped, a magic wand of photoelectric cells set off five unconnected flash tubes to illuminate the scene.



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Kodachrome by Edwin L. Wisherd

In This Aerial Cancan, 60 Girls Whirl on Ropes Swung by Top-hatted Partners. The Act Encircled Boston Garden Arena

© National Geographic Society

A Wistful Pied Piper Watches Prince Charming

In hobo rags Emmett L. Kelly sees Cinderella's Prince Charming ride by.

Kodachromes by Harold E. Edgerton

While Nets Are Spread, Clown "Walkarounds" Fill In

Felix Adler sees through a buttonhole far below his false head and shoulders.

© National Geographic Society

Kodachrome by Harold E. Edgerton

End of the Act: Unicyclists Dramatically Break Their Human Pyramid

Even anxiety is recorded on the faces of the acrobats as "understander," the bottom man, checks the cycle and tosses "topmounter" and middleman gracefully to the floor.

Minus Half a Hip Torn by a Tiger, Trainer Proske Still Works with Giant Bengals

"It was my fault for making the cat act when he had a headache," he explained after a near-fatal mauling.

© National Geographic Society

Kodachromes by Harold E. Edgerton

Making an Elephant Lie Down on Cue Requires Tact and Patience

Mountainous prima donnas will do the stunt without objection at their convenience, but Laura May Petrello and the keeper use persuasion when her mount gets temperamental. Elephants remember old tricks for years.

Kodachrome by Harold E. Edgerton

Kodachrome by Edwin L. Wisherd

Banking Nicely, Adam Makes a Fast Turn—A Canine Clown Takes a High Hurdle

To a chimpanzee good balance and co-ordination come naturally. He is easily taught to skate and ride bicycles. Most funnymen have pets, usually dogs, ducks, pigs, and geese. Dogs are often vagabonds that joined the circus.

© National Geographic Society

Kodachrome by Edwin L. Wisherd

A Hilarious Hit, the Water-squirting Camera Was Taken to a White House Party

Clown Paul Jung, who designed and built the spitting "birdie," has fashioned countless mirth-provoking props in the course of his long career. Fans always recognize clowns by their facial make-up; it never changes.

© National Geographic Society

Kodachrome by Harold E. Edgerton

To the Tightwire Performer the Rigger Behind the Stand Is All-important

The man who controls the slender cable on which Lola Dobritch cycles is in constant danger of being slashed if the slender thread breaks and coils back. He controls the tension at the direction of the artiste.

© National Geographic Society

Kodachrome by Harold E. Edgerton

Even the Sudden Light for a Speed Shot Does Not Disturb Dobbin

Broad-backed Percherons such as this reliable mount in the Bostock-Seifert routine are trained to gallop precisely the same number of paces each time around the ring. On their steady gait depends the safety of the performers.

are mostly underpaid, overworked, and underappreciated, but theirs is a rich heritage and they perform to the obligato of children's laughter. In this respect, at least, they consider themselves well paid.

Their ancestors are the comics of the Greek theater, the court jesters of the Middle Ages. Joe Grimaldi was so famous that his memoirs, edited by Charles Dickens and his father, in its first edition outsold the famous *Oliver Twist*.

Grimaldi, while a theatrical rather than a circus clown, nevertheless achieved a sort of immortality in the circus because his name is the sobriquet for clowns in general. They are called "Joeys" even now, after Joe Grimaldi.

Some clown routines are good forever and, like other standard ingredients of the circus, should not be tampered with lest people bringing children for their first circus attendance fail to show them some of the identical thrills which they had experienced long ago.

Surely nobody would want to discard the poignant pantomime of Charley Bell and his little fox terrier with its faked rabbit ears, and the hunting scene in which the "rabbit" pretends to be shot and then falls out of the clown hunter's bag and trots happily and secretly behind him.

Circus clowns never seem so happy as when they are entertaining shut-ins in a crippled children's ward or in some such place off the beaten path of the red wagons. For such excursions they have little time, but they seldom turn down a request for a hospital show. Clowns appear ten or more times in the course of a performance and do it every afternoon and night except some Sundays when the circus is traveling. They wear the same make-up throughout the show, but change costumes frequently.

A circus clown can get his intricate make-up on in ten minutes if rushed, but he likes to take half an hour. He can do it without a mirror if he has to when an emergency arises. He uses pounds of powder and cold cream and red paint and other cosmetics on a tour, yet his complexion seems to thrive.

I wrote a circus article for this Magazine 17 years ago, after I had trouped with the biggest circus in the world for one season.* Since then I have spent most of my years with this same attraction. Some of the pristine shine of the first experience has worn off, but still, when I watch the miracle of circus day, I feel like the awestruck rustic who beheld a giraffe for the first time in his life and remarked, "Heck! There ain't no such animal!"

* See "Land of Sawdust and Spangles," by Francis Beverly Kelley, NATIONAL GEOGRAPHIC MAGAZINE, October, 1931.

Circus Action in Color

By HAROLD E. EDGERTON

ABOUT nine years ago, photographers began to use special gas-filled tubes for motion-stopping flashlight photography. These lamps, entirely different from conventional photoflash lamps, produce a brilliant flash, brighter than sunlight, of extremely short duration. Photographs can be made in as little as one-millionth of a second.

The tubes, resembling coiled neon tubing, were originally developed in 1931 by associates and myself for study of moving machines. They have two big advantages over ordinary flashbulbs: They can be used over and over again, and the extremely high speed makes it possible to "freeze" motion of subjects, such as flying birds, hitherto usually recorded on film merely as blurs.*

For years Boston Garden, a huge indoor sports arena, has been a challenge in my photographic experiments. Its vast areas, affording little or no reflecting surface, absorb the light like a void, and ever-present dust and smoke add to the difficulties.

I attempted several times before the war to get color photographs at a Garden ice show by massing all the flash equipment at my command in a box at the edge of the ice. Although close-up pictures were recognizable, the over-all effect was poor because of the ill-defined background and limited coverage.

Night Aerial Photography

At the Massachusetts Institute of Technology my associates and I developed during the war a large, xenon-gas-filled quartz flashtube, the FT-617, for night aerial photography and reconnaissance work.

These tubes, carried by airplane, furnished

* See "Hummingbirds in Action," by Harold E. Edgerton, NATIONAL GEOGRAPHIC MAGAZINE, August, 1947.

Staff Photographer Edwin L. Wisherd

To Photograph the Circus in Color, Dr. Edgerton Assembled the Largest Set of Flash Equipment Ever Used at One Time

Beside Dr. Harold E. Edgerton (right) stand his associates, right to left: Fred Barstow, Bigelow Green, Irving Eastman, and George Bierce. Value of the ponderous one-and-one-half tons of equipment totals $20,000. Small flashtubes, in reflectors at upper center, flashed at a speed of 1/1000 of a second, the two larger lamps at 1/500.

Lawrence D. Thornton from Three Lions

Young Lady Meets Elephant as the Circus Comes to Town

Unloaded from the trains in the gray dawn, the "ponderous pachyderms" are first fed and then put to work setting up the tent city (page 292). In big-show parlance they are called "bulls," whether male or female. They are always looking for peanuts even in the back lot.

sufficient light for the taking of picture sequences from an altitude of half a mile or so. The technique was used extensively in the European theater of war and over Burma.

Shortly after the war I rigged two FT-617 flashtubes in the balcony of Boston Garden in an attempt to obtain color photographs of the circus.

The photographs proved encouraging, but even they lacked sufficient lighting in the background, because lights were not aimed from the camera position and because color film is much slower than black-and-white.

Last May, with the expert assistance of Edwin L. Wisherd, chief of the photographic laboratories of the National Geographic Society, I repeated the experiment with greater success.

The Raytheon Manufacturing Company had just completed some intermediate-size flash units which they made available for our use. Hanging the reflectors of these units about 60 feet above the spectators to insure satisfactory over-all background lighting, we succeeded in taking some of the accompanying pictures of scenes in the Ringling Bros and Barnum & Bailey Circus during its stand in Boston Garden (Plates I-VIII).

The light given off by a xenon tube has a color quality remarkably similar to that of daylight. For this reason, daylight-type color film can be used with xenon lighting by using a light filter that absorbs the slight excess of blue. Quartz is used instead of glass in these large flashtubes to withstand the violent heat shock which occurs when the energy is flashed momentarily in the tube.

Ton-and-a-half of Equipment

A few facts about the equipment used may be of interest to photographers. At the circus we used: 2 flashtubes, type FT-617, each of which flashed from 1200 microfarads at 4000 volts (9600 watt-seconds), and 6 flashtubes, type FT-503, each of which flashed from 350 microfarads at 4000 volts (2800 watt-seconds).

The total weight of the equipment, including the condenser banks which supplied the power, was about a ton and a half.

Each of the FT-617 tubes in a 30-inch reflector had a guide factor of 250, when used with daylight Kodachrome film and a CC15 filter. This means that a photograph at F 5.6 could be made with the light about 45 feet from the subject. Most of the pictures were made at F 4.5 to F 8. The total energy used for each flash was 36,000 watt-seconds.

For purposes of synchronization, the camera shutter was set at 1/400 of a second, though the flash itself lasted only about 1/500 of a second.

We did not light the entire circus group simultaneously. First, we worked on the center ring by locating the two large reflectors 55 feet above the ground on the edge of the balcony, some 75 feet from the center and about 50 feet apart. Three of the smaller reflectors were hung 60 feet above the crowd on the opposite side from the camera, and these were directed downward and backward to illuminate the spectators. Other reflectors were placed on the floor to give emphasis wherever needed.

Moving the Reflectors

Between performances we moved the reflectors so that we could cover additional subjects of interest. Since the circus was in Boston from May 13 to May 21, and with matinees for most of the time, we had ample opportunity to pick our shots. One or both of us attended virtually every performance.

One would think that the intense flash of the xenon tubes would bother performer and audience. This is not the case, for several reasons. First of all, the flash is of very short duration and of a blue color, which is not so visible as the harsh light created by the common flashbulbs. Second, the xenon flashtubes in this instance were located high in the Garden, so that they were not within the line of vision of any of the people. Actually, the arc spotlights cause more annoyance than the flashtubes.

The principal disadvantage of the electric-flash system is the trouble experienced in transporting the equipment and connecting it. However, once it is in position, any number of photographs can be taken at intervals depending upon the charging time of the condensers.

During the shooting of the performances, some 300 35-mm. Kodachromes were exposed, in addition to the many 4x5″ and 5x7″ films that were made.

Phototube synchronization (simultaneous tripping of lights by photoelectric cells) was employed, so that the camera could be used at any position in the Garden.

Circus workers were most cooperative about accommodating our equipment where space on the sawdust was at a premium. Only occasionally did we get tangled up with an animal cage or some other piece of weird equipment.

Nevertheless, when we take apart our flash equipment for overhaul, red sawdust still sifts out, to remind us of the time we photographed the circus.

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Kodachrome by J. Baylor Roberts

"It Was Just Like in the Storybook, Almost," Says the Circus Cinderella (Plate XVII)

When Theresa DuHaime, from New York's Bronx, joined the circus, she had no dream of starring in the principal spectacle. She appears also in the aerial ballet and other fancy-dress acts. Elephants draw her golden chariot.

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Kodachrome by Edwin L. Wisherd

Lying Under an Elephant Isn't So Dangerous, for It Is Supported by the Elbows and the Girl Can Prod It with Her Spiked Stick

© National Geographic Society

Ektachrome by J. Baylor Roberts

Circuses Give 12 to 14 Shows a Week, So Wardrobe Wagons Roll Right into Dressing Tents to Make Quick Changes Easy

© National Geographic Society

The Midway Is a Magic Lane That Leads into the Realm of Make-believe

Always a set pattern is followed in placing the parts of the big show. The ticket wagons and refreshment and novelty stands are lined up on one side of the main entrance.

Kodachrome by Willard R. Culver

Down Its Tanbark Path Walk Millions of Americans in the Course of a Circus Tour

On the other, the side-show tent displays its strange posters, and barkers harangue the crowds. The menagerie tent (background), where wild animals are displayed, will disappear completely before the last show is over.

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Kodachrome by Willard R. Culver

"They Wiggle Like the Jelly on Your Dinner Table!" Side-show Hawaiian Dancers Perform 30 Times a Day

Clowns and Pageant Performers Await Their Cues in the Circus Yard

No fastidious housewife has a more difficult laundry problem than clowns, who must keep a white wardrobe fresh and spotless and who don't like to trust it to a laundry. Clowns take pride in the originality of their costumes and usually design their own.

Fred Hanlon and Charley Bell even look after the linen for their trick dog, Peanuts.

The wardrobe department takes care of circus-owned clothes worn by Vicki Bakken and Johnny Burnside (right).

Horses and elephants gain or lose weight quickly, and keeping their trappings in proper fit is a headache.

© National Geographic Society

Kodachromes by Willard R. Culver

Aerial Acrobats Keep Their Nerve Up, Their Wrists Dry

The Behees of the flying trapeze tape and powder their arms, for they catch wrists, not hands, to avoid falls.

© National Geographic Society

Ektachromes by J. Baylor Roberts

"Snow White" Watches While Her Dwarf, "Happy," Has His Lips Retouched

Paul Jung, creator of many circus-clown stunts, designed the papier-mâché heads for this storybook group. Each funnyman sticks to his own clown type—pathos, comedy, tramp, Pierrot, rustic, etc.

© National Geographic Society

Ektachrome by J. Baylor Roberts

To the Baby Bengal, Fondling, Even by Cinderella, Is Distasteful

In another month the little tiger will be too big to handle. Trainers prefer to work with jungle-bred cats, for those born in captivity may have lost their natural fear of man.

© National Geographic Society

Kodachrome by J. Baylor Roberts

To Mount Their Elephant Steeds, Circus Girls May Climb Ladders or Be Lifted and Swung Aboard by a Friendly Trunk

Elephants at the right are wearing butterfly wings and antennae for their role as part of a hitch of six that pulls Cinderella's chariot. A rogue, or bad elephant, appears occasionally, but is more apt to injure a keeper than a stranger. Most circuses employ only female elephants; they are more tractable than bulls.

© National Geographic Society

Clowns Are Kind to Animals—

In the wild-animal menagerie voiceless Edith, the giraffe, is Felix Adler's favorite.

Ektachromes by J. Baylor Roberts

and to Pretty Circus Girls!

Paul Jerome and Lou Jacobs give Janie DeYoung a lift across a muddy lot.

© National Geographic Society

Ektachrome by J. Baylor Roberts

The Prospect of a Banking Career Never Made Harry Dann Smile Like This

He ran away from his father's business in Missouri and became a typical chalk-face clown. In his spare moments he teaches school for circus children, especially those of newly imported troupes that speak no English.

© National Geographic Society

Ektachrome by J. Baylor Roberts

Melancholy Kelly Impersonates a Character He Created as a Comic-strip Cartoonist

Though he dresses in rags and his make-up seems smeared on, Emmett Kelly works meticulously to create a sad, wistful, and always hungry look. When the weather is hot, his putty nose begins to run.

© National Geographic Society

Kodachrome by J. Baylor Roberts

A Priceless Relic of Bygone Circus Parades Is the Famous Ringling Chime Wagon

Its bells, cast in 1892, rang through the streets of America until 1920. It is used now only in the show's tented spectacles.

© National Geographic Society

Chimp Mirrors His Trainer's Look

Fond of applause, chimpanzees love to imitate their human friends.

Ektachromes by J. Baylor Roberts

Oldest Clown, Johnny Tripp, "Doubles in Brass"

In the spectacle he plays the carillon. Comics change costumes, make-up never.

Kodachrome by J. Baylor Roberts

"I Got in It When I Was a Little Boy," Lou Jacobs Explains

How he tucks himself inside the tiny vehicle mystifies both circus dwarf cops and Denver policemen.

© National Geographic Society

Ektachrome by J. Baylor Roberts

The Circus Has Its Own Medical Department Headed by Dr. Robert P. Harris

As he tapes an ankle for pretty aerialist Mildred Keithly, he lends support to the argument of some of his fellow showfolk that work as pleasant as his ought to be done free.

Along the Yangtze, Main Street of China

By W. Robert Moore

With Illustrations from Photographs by the Author

WERE the Chinese to label their highroads of traffic, they might well stud the banks of the Yangtze River with signs reading "China National Route No. 1."

On the map face of China the river stands out like a bold blue artery. Fly over the land, and its wide-sweeping flood unfolds below like an endless khaki-yellow ribbon, a band that ties valley towns together or lies tangled among mountain ridges (map, pages 344-5).

Great River, Long River, and River of Golden Sands the Chinese variously call their watery Main Street. To millions of its people it is *The* River. The name Yangtze, by which it is known to Westerners, is applied locally only to its lower course.

Rising in the lands north of Tibet, it hurtles down from lofty uplands and surges through awesome canyons of its own carving. In the lonely fastness of inner Asia the river seeks close companionship with two other gorge-hewing torrents, the Mekong and Salween.*

Then, as if emboldened by its early mountain triumphs, it twists, brawls through rocky trenches, loops back upon itself, and turns eastward. After wriggling and hammering its way through more mountains and valleys, it etches a serpentine path across the flat plains of central China.

3,400 Crooked Miles

Some 3,400 crooked miles it flows, gathering up tributary waters and ponderous burdens of silt, and pours a staining flood into the East China Sea.

The storied Nile which fostered the ancient civilization of Egypt is longer. So, too, are the Amazon and our own Mississippi-Missouri system. But none of these streams, nor any other river, touches so many lives as does the Yangtze.

Two hundred million people, roughly a tenth of the human race, live within its basin. Here have grown some of the country's largest cities, and here are concentrated many of its intensively cultivated farms.

Farms? "Gardens" is a better term, for many districts have an agricultural population of more than 2,500 persons to a square mile!

Throughout the Yangtze plain the population averages 900 persons per square mile, three-fourths of them farmers.

Far back in the interior, 1,500 river miles from the sea, and with the Yangtze as almost its sole means of access, lies the rich Szechwan basin (Plate IV).† Here the land is only a little less crowded, for 43 million persons are packed into a 75,000-square-mile humid "greenhouse" of farms.

Even the mountains through which the river has hewn its way are not without people. Precipitous lands have been terraced with infinite patience and reveal an amazing jigsaw pattern of curves, angles, and odd-shaped garden patches.

For five of the eight bitter war years that China fought against Japanese invasion more than 1,000 miles of the Yangtze were held by the enemy.

Swiftly, Japanese forces had seized Shanghai, Soochow (Wuhsien), and the capital, Nanking, and then swept on to Hankow and beyond to gain control over the lower and middle sections of the river. Only at the gateway of the famous mountain gorges, near Ichang, was their upriver march stopped.

A Parade of Chinese Life

Again there is traffic along this vital arterial waterway. From planes, on river boats battling muddy torrents through spectacular gorges and coursing flat farm lands, and in cities from Shanghai to distant Chungking, I watched a parade of teeming Chinese life.

Clumsy junks, patched-sail sampans, fishing craft, rafts, and such river steamers as the Chinese still possess were plowing new furrows up and down the yellow silt-laden waters. People and supplies were on the move.

On this trip to China I came by air. Roaring over the lush Yangtze Delta with its myriad tiny farms, we saw Shanghai's temples of trade rush up out of what only a moment before had been a blob on the landscape.

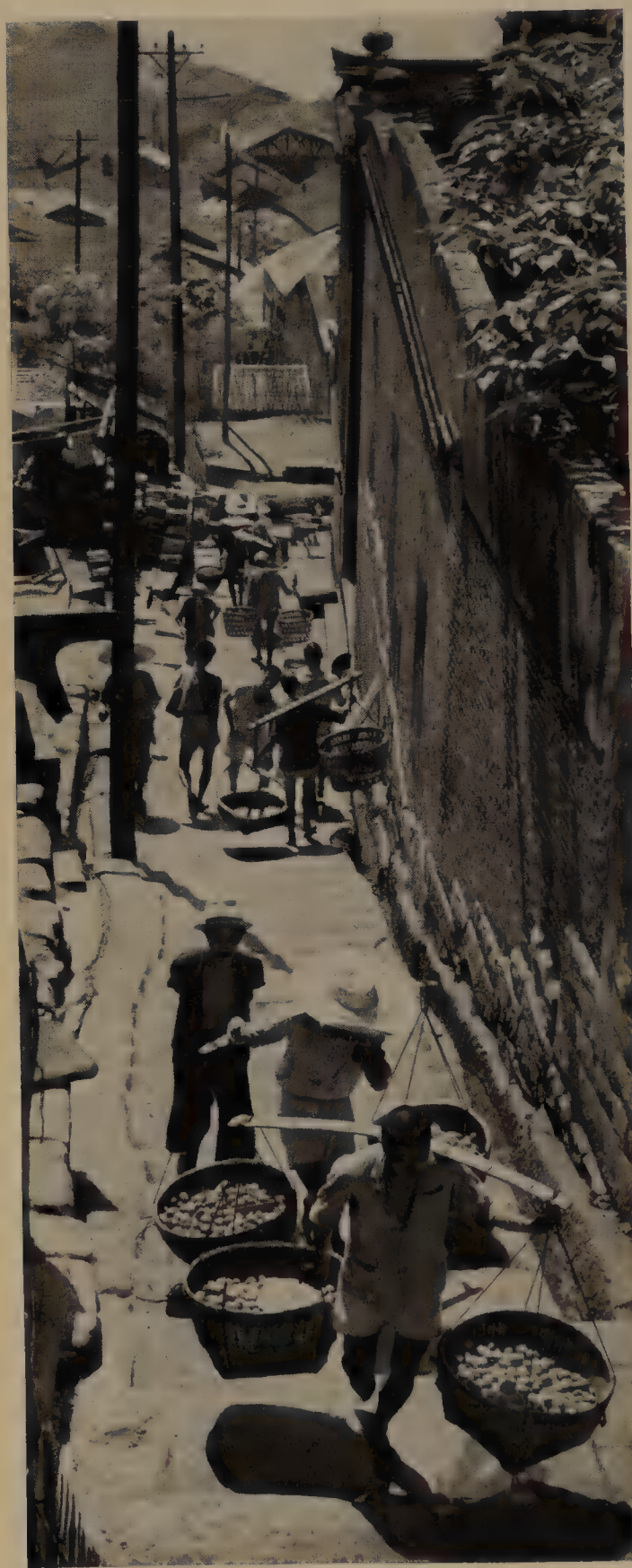
Beneath us slipped factories, skyscrapers, Chinese pagodas, wide boulevards, and a maze of rooftops. Ships of all kinds filled the Hwang Pu River for miles.

From the air or from the ground Shanghai is a spectacular, contrasting city.‡ Neither

* See "Through the Great River Trenches of Asia (Yangtze, Mekong, and Salween)," by Joseph F. Rock, National Geographic Magazine, August, 1926.

† See "China Fights Erosion with U. S. Aid," by Walter C. Lowdermilk, National Geographic Magazine, June, 1945.

‡ See, in the National Geographic Magazine, "Cosmopolitan Shanghai, Key Seaport of China," by W. Robert Moore, September, 1932; "Changing Shanghai," by Amanda Boyden, October, 1937; and "Today on the China Coast," by John B. Powell, February, 1945.



No Escalators—Take the Steps!

With baskets of potatoes and other produce hung from poles across their shoulders, Chinese trot up and down the narrow stepped streets in Chungking. Wealthier persons ride up and down the steep flights in sedan chairs. These walls and paving blocks survived the Japanese bombing, but most of the houses in the distance are new (page 343).

Chinese nor yet European, it is a fantastic mixture of both. Here are modern offices and lofty edifices. Here, too, are congested districts threaded by banner-draped alleys.

From the 17-story Broadway Mansions, where we correspondents lived, I could look the length of Shanghai's sky-scraper-lined Bund (Plate XV and pages 328-9). Still closer was Soochow Creek, where huddled tiny boats upon which thousands of families lived their cramped lives. On the decks women worked and babies played. Most of the toddlers were tied with cord leashes to keep them from toppling overboard. Laundry fluttered like flags from bamboo poles (Plates IX, XII, and XIII).

Out on the river, junks, lighters, and sculled sampans swarmed about ocean-going steamers, river boats, and naval craft.

Changes in Shanghai

Before the war the city had some 3,500,000 persons. Among them were peoples from almost every nation on earth. Over 1,000,000 lived in the International Settlement, the concession run jointly by several foreign powers. The others dwelt in the separate French Concession or in the ever-expanding Chinese sections of the city.

Today a Chinese mayor governs all Shanghai. Extraterritoriality in China was relinquished by the Allied nations during the war.

At the beginning of the Japanese invasion, and since, tens of thousands more people flocked to this already congested port. There are between 4,000,000 and 5,000,000 inhabitants here now, some officials say.

Always fantastic, Shanghai seems even more unreal in these months since the war. War-created shortages still exist, and the black-market operators know few bounds.

So unstable is Chinese currency that many stores quoted prices in U. S. dollars until the Government clamped down on the trade.

Most shop windows are filled with goods, but the cost is so high that many articles never leave the display racks.

For a time in 1946, when the official rate between C.N.C. (Chinese National Currency) and U. S. dollars was set at 2,000 to 1, I saw some nylon hose in a show window priced at C.N.C. $49,000

Shanghai Coolies Load a Shipment of Relief Flour on Waiting Trucks

Here bags of flour and bales of cotton are discharged onto the Bund from ships. UNRRA and CNRRA (China National Relief and Rehabilitation Administration) had charge of the distribution to the needy until the end of 1947. A new organization will continue to distribute food to China.

a pair. Nearly every time I passed the store later I found a new price tag, usually $1,000 or $2,000 higher!

Inflation has since beggared those figures (page 342).

Yet swank night clubs thrive. Under soft lights Chinese and a few foreigners dance with slim silk-clad hostesses to music of White Russian or Filipino orchestras.

"Big difference here today is the cry of the beggars," said one facetious old China hand. "Now they wail, 'No mamma, no papa, no flight pay, no per diem.' And you have to toss them a $1,000 bill instead of a copper."

Shanghai suffered no war damage such as I was to see later in Nanking, Hankow, Ichang, and in Chungking. Its problems are not reconstruction, but the resumption of normal world trade.

Against this future trade the Hwang Pu Conservancy Board has its pencils busy.

"Before the war nearly 38,000,000 tons of shipping entered and cleared the port annually," said one of the Board members. "About 25,000,000 tons were foreign-type ocean-going and coastal vessels. To keep the harbor in order, we had to dredge 3,000,000 tons of mud from the Hwang Pu every year.

"The Japanese did little dredging during their occupation, so we've considerable work to catch up before we extend improvements.

"Not only the Hwang Pu River but also the Yangtze bar comes under our jurisdiction," he continued. "To accommodate larger vessels, we were dredging a channel through the bar. At low tide there's only about 18 feet clearance. Big steamers had to wait for high water. We shall start working on that again as soon as we get the dredge the Japs took away."

"How much mud does the Yangtze dump in the ocean every year?" I asked.

"About 400,000,000 tons—but that is just an estimate." *

Rich Farms on River Soil

Rich farms spread over the alluvial Yangtze soil. As you ride from Shanghai to Nanking by rail, highway, or by plane you see a veritable garden of patiently groomed fields.

Here men and women toil endlessly with primitive hand tools to make their tiny plots

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Taming the Outlaw Missouri River," November, 1945, and "Men Against the Rivers," June, 1937, both by Frederick Simpich.

Shanghai's Teeming Bund Faces a Wide Curve of the Hwang Pu River

Here, 15 miles from the Yangtze, is China's biggest city. Sampans, lighters, and small river steamers tie up along the water front. Big ships dock upriver or downriver. Anchored in midstream is the cruiser U.S.S. *Los Angeles*.

Tall Temples of Trade Crowd Its Busy Business District

Rectangular building facing the Bund is the Bank of China; clock tower marks Customs Building. Center tall structure (right) is the New Development Building, containing U. S. Consulate General.

U. S. Navy, Official

Steaming up the Yangtze on a Relief Mission, an American Landing Ship Passes Shihpaochai, or "Precious Stone Castle"

LSM 470, a veteran of Okinawa, was carrying 315 tons of rice from Hankow to a famine area around Chungking. Atop the vertical outcrop of rock the Chinese built a monastery. Legend says that rice once trickled from the rock to feed the priests, but stopped when they dug the hole larger to increase the flow (page 347).

Nanking, Again China's Capital, Seems about the Same after Eight Years' Japanese Occupancy

Some buildings were damaged, but destruction was not extensive. Dr. Sun Yat-sen, China's revolutionary hero, gazes from his pedestal in the circle. Banks, restaurants, offices, and shops rise around this busy center of the city. In the distance looms the ancient city wall, more than 20 miles in circumference (page 332).

produce rice and other crops to feed China's millions of hungry mouths. Continuously, winter and summer, this part of China's good earth nourishes wheat, beans, rape, barley, corn, and huge quantities of rice.

Not until I flew over the region did I realize how the land is laced with irrigation and transport canals. Up and down and across the plain, narrow waterways grid the countryside as streets segment a city.

Slender channels are the "roads" for small farm boats; the larger ones form busy trucking highways.

Through this region, too, threads the most famous of China's man-made water routes, the Grand Canal (Yun Ho). From Hangchow in the south it stretches all the way to Imperial Peking (Peiping), over 1,000 miles away.*

The section which links the Yangtze with the Hwang, or Yellow, River, has been serving as an inland waterway for nearly 2,500 years. The section extending southward to Hangchow from the Yangtze intersection at Chinkiang, however, is a mere stripling. It is only seven or eight centuries old!

Although some parts of the channel are badly silted now, day in and day out men still tread its towpaths pulling their boats. When favorable breezes blow, the canal blossoms with sails.

Sails on Tai Lake

One of my most memorable pictures of sails, however, was not on the Grand Canal but on near-by Tai Hu (lake). It was late afternoon and the sun was paying golden tribute to the west following a storm. Scores of craft had their white sails spread and were skimming across the orange-stained waters as if they were staging a huge regatta.

The lake is one of numerous large bodies of water which lie on either side of the Yangtze the whole length of the plain. Some of these lakes act as huge reservoirs and fill or discharge with the rise or fall of the river.

During the weeks I spent in Nanking I saw the city gradually being set in order again as capital. The Government was bringing personnel, files, and office equipment back from Chungking, the war capital (page 326).

Some of the people came by air; others had taken a circuitous route overland by road, rail, and river. But most came by boat down the Yangtze.

The water front at Hsiakuan, a short distance beyond Nanking's gray city wall, was crowded with large river craft that had brought loads of goods downstream. River steamers were packed with incoming passengers.

Despite high costs and scarcity of materials, some new building had been started, and many shops were being refurbished and painted.

Although Nanking, under various names, has figured prominently in Chinese history for 2,000 years, it has had many ups and downs.†

Several times through the centuries it has been the capital, only to lose its exalted position and suffer extensive destruction. During the Taiping Rebellion it was held by the insurgents from 1853 to 1864 and was almost completely razed.

Even today large areas within its 20-odd-mile circuit of thick, weathered walls are given over to farms and truck garden patches. The airport, too, is within the walls.

Nanking Had Its Face Lifted

When the capital was moved here from Peking in 1928, the town had no wide paved streets, no running water and sewer systems, no electricity. But the National Government set about converting the town into a modern capital. They slashed broad avenues through clusters of dingy dwellings; built new government departments, hospitals, schools; and provided the town with modern facilities of water, light, and transportation.

War gave it a serious setback, but comparatively few of its new structures were damaged beyond repair.

Beyond the meandering city wall rises Purple Mountain, Nanking's most prominent landmark.

One could almost say "sacred," for high on its side stands the imposing mausoleum of the revered Sun Yat-sen, Republican China's "George Washington." It remained undamaged, despite battles fought beside it.

From the hill roadway where cars park you pass through an imposing ornamental archway and then ascend a broad walk and flights of 500 granite steps to the massive Memorial Hall and tomb, high on the side of the mountain. White walls and deep-blue tiles gleam in the sun against a green backdrop of trees (Plate XIV).

The last resting place of the first Ming monarch is less favored. It lies farther down the hillside, nearer the city. Parts of the buildings were destroyed years ago by the Taipings; time is gradually leveling the rest.

The stone camels, elephants, horses, mythical beasts, and men which lined the avenue to the tomb remain largely intact. Cattle graze

* See "Grand Canal Panorama," by Willard Price, National Geographic Magazine, April, 1937, and "Glory That Was Imperial Peking," by W. Robert Moore, June, 1933.

† See "Rise and Fall of Nanking," by Julius Eigner, National Geographic Magazine, February, 1938.

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Kodachrome by W. Robert Moore

Riding the Favoring Wind, a Big Freight Junk Glides up the Muddy Yangtze

It has just emerged from Wind Box Gorge. The crew tow the craft up swift rapids with bamboo ropes.

© National Geographic Society

Kodachrome by W. Robert Moore

Bold Walls Hem Wushan Gorge and Dwarf the Junks That Sail the Yangtze

Against the towering cliffs even river steamers seem tiny. Native craft, some with spinnakers set to gain added boost, ride a favorable upstream wind. Along the narrow footpath at left trackers haul the boats against the treacherous currents when the winds are adverse (Plate VII).

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Kodachrome by W. Robert Moore

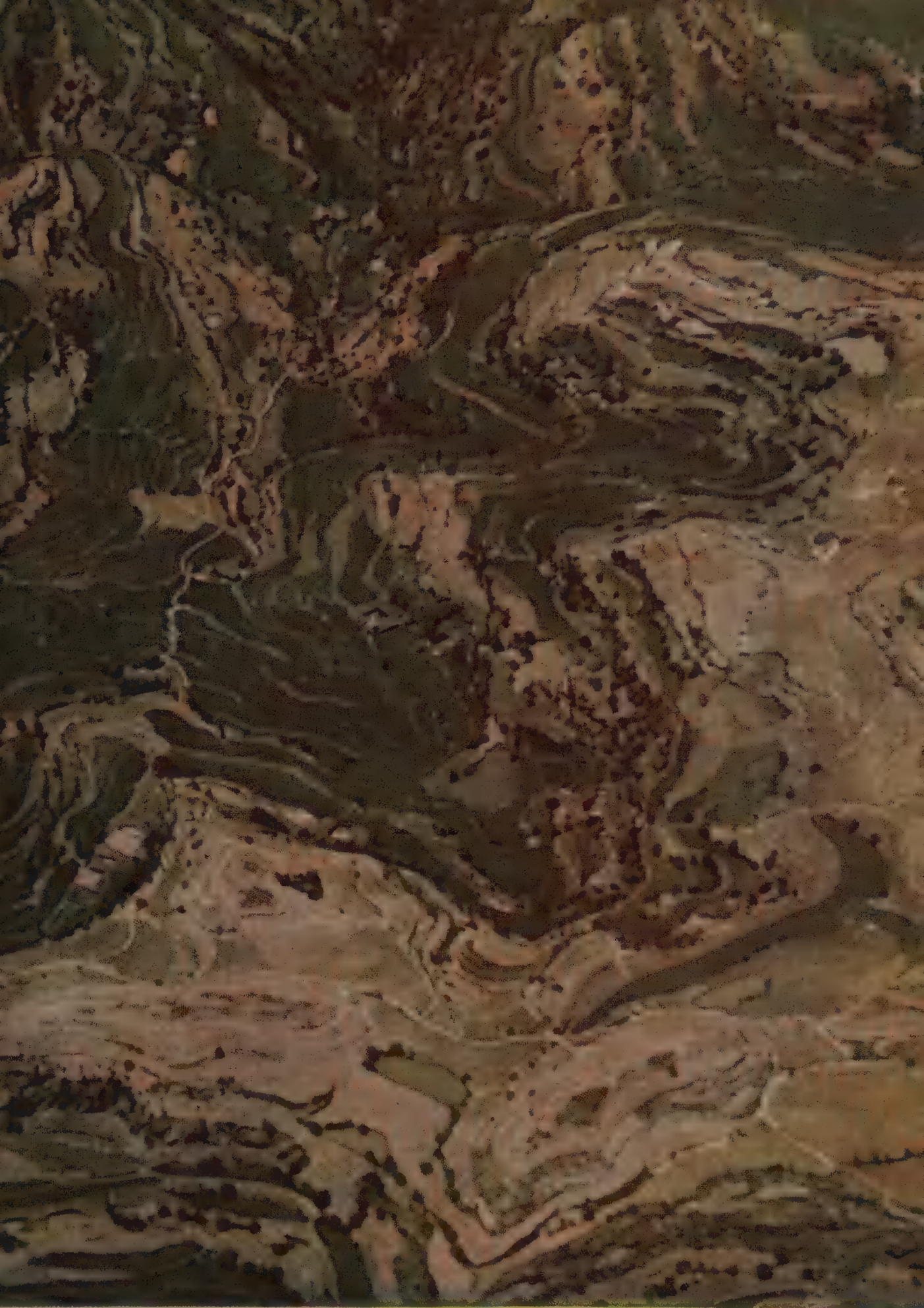
Crowds Toil Up and Down Long Flights of Steps That Mount Chungking's Steep Hillsides

Small ferry sampans mill about, loading and unloading passengers who cross between this large Szechwan city and its suburb on the opposite bank of the Kialing. The wartime capital of China perches on a series of rugged cliffs at the junction of that river with the mighty Yangtze.

© National Geographic Society

With Infinite Toil Szechwan Farmers Cultivate the Mountains

Here they raise rice, corn, and other cereals. Some fields are green with growing crops; others have already been harvested. Flying over, the author saw piles of yellow grain in courtyards of homes.



Kodachrome by W. Robert Moore

Steep Slopes Are Terraced with an Amazing Jigsaw Pattern of Farms

Small irrigation ditches and paths also thread the region. These farms lie near the sweeping loop of the Yangtze between Yunyang and Wanhsien. Fogs, rain, and summer heat afford excellent growing conditions.

© National Geographic Society

Kodachrome by W. Robert Moore

With Huge White Sails Set, a Fleet of Junks Parades Past Fengkieh on an Upriver Journey

Other craft are moored almost solidly along the steep bank, atop which stands the medieval walled town. When the river is low, a shingle beach lies exposed just below here. Natural brine bubbles up in the uncovered beach. Men boil the spring water in iron kettles to extract its salt.

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Kodachrome by W. Robert Moore

Steep Cliffs Form a Spectacular Gateway at the Western End of 30-mile Wushan, or Witches, Gorge

Here, in this upstream view, the Yangtze twists around Wen Shan (Mountain of Learning) and enters the constricted mountain trench (Plate II). Atop the peak are shrines to the spirits of mountain and air. On the bend of the river, but concealed by the rocky spur, lies the walled town of Wushan.

Chinese Soldiers, Riding a River Steamer, While Away Their Leisure Playing Cards

Others sleep under parasols and sheet tents on the hot upper deck (Plate XI). Scattered about them are rifles, small bedding rolls, and sausagelike cloth bags of rice. Most men are barefoot.

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Kodachromes by W. Robert Moore

Coolies Trudge up Chungking's Steps with Baskets of Produce on Shoulder Poles

One carries long bitter gourds used as a vegetable; the other has potatoes. Long flights of steps lead up from the river to hill streets and homes. Szechwan is noted for the abundance and variety of its foodstuffs.

on the green grass that covers the roadway between the stone figures.

One day as I rode across to Pukow, the railway terminal on the opposite bank of the Yangtze from Nanking, I saw hundreds of ducks along the edge of the river.

"They're 'walkee-walkee' ducks," announced my companion.

"You mean 'walkie-talkie,' " I retorted, as the entire flock seemed to be quacking all at once.

"No, they gain the name from their novel handling. When the ducklings are young, they are started downriver in large groups. They feed as they go. Eventually they land in market fully grown and fattened. Feeding and transportation hasn't cost anything beyond the time of men who keep the flock together. Nothing could be simpler."

Back in 1931, when I had come down to Pukow by train from Peiping, the Yangtze was in flood. We traveled for miles with only the rail embankment and a few field dikes showing above a sea of water. People rode into Nanking by boat.

Yangtze Diked Against Floods

I recalled that experience when I talked with engineers of the Yangtze River Commission.

"The flood you saw in 1931 was the highest on record," said one of the directors. "That year more than 31,300 square miles was flooded. In 1935 there was a smaller flood, mainly above Hankow, which covered 9,660 square miles. As a whole, the Yangtze is a comparatively peaceful river, not a demon like the Yellow River." *

"How much diking is done along the Yangtze?" I queried.

"Practically the whole way to Ichang. In many places the dikes are about 25 feet high, but in most places only from 10 to 15 feet."

"What about irrigation?"

"Along the Yangtze, it's mainly a problem of drainage, not irrigation," he explained. "In high water the Yangtze rises well above the plain."

Later, when I went to Hankow, I saw the high water-front wall that was built some years ago to protect that city against flood.

In my hotel the high-water mark of the 1931 flood had been painted on the wall. It was 53.8 feet above the normal low-water level of the river!

War, not floods, has caused recent destruction in Hankow. Particularly along the water front and in the former concessions many buildings and installations have been bombed and demolished. Some damage came at the time of its capture by the Japanese, but more was done when American bombing teams crippled Japanese activity there.

The "Chicago of China"

"Chicago of China" some people have dubbed this central China city. Although 700 miles from the sea, it had a spectacular rise. One should not refer to it as a city, for there are three separate centers here—Hankow, Wuchang, and Hanyang.

Among these three "Wuhan Cities" Hankow is the largest and most modern. It gained much of its prosperity from foreign enterprise, and here were located extensive foreign concessions, now turned back to Chinese control.

Wuchang, capital of Hupeh Province, sprawls on the hills and plain on the opposite bank of the Yangtze. On the same bank as Hankow, but separated from it by the Han River, is Hanyang, where there were large iron and steel plants, a government arsenal, and powder works.

At the moment much industry of the Wuhan Cities is at a standstill. Only Chinese ships come and go. Foreign steamers are stopped by new regulations against coastal and inland waterway trade.

Along the Bund I watched scores of native junks loading for the upriver trip to Tung Ting Hu (lake) and thence to war-torn Changsha, over which the Chinese and Japanese repeatedly fought. Other craft moved in white-winged processions down both the Yangtze and the Han.

Huge log rafts also floated downstream. With thatched huts perched atop them, they appeared like village blocks broken loose and drifting in the current.

The Gorges from the Air

From Hankow I flew to Chungking. Out at the Hankow airport I fell into conversation with the American pilot of the Chinese commercial plane.

"When we level off, come up front and have a look," he suggested.

I needed no second invitation.

"Ever seen the Yangtze gorges from the air?" he asked.

I had not.

"Neither have I," he rejoined. "Let's do it; it's only a few minutes farther than the regular course we fly."

He flicked the controls slightly and set the course for Ichang.

* See "Taming 'Flood Dragons' Along China's Hwang Ho (River)," by Oliver J. Todd, National Geographic Magazine, February, 1942, and "Raft Life on the Hwang Ho," by W. Robert Moore, June, 1932.

Paul Guillumette

Prosperity Brings Smiles to the Faces of Li Shin and His Wife

A few years ago, with money saved as a press messenger, he set up a tobacco shop in Chungking. Now he has a large stock and does a thriving business. Because of inflation, his original investment now would not buy a package of the cheapest cigarettes. In mid-December, 1947, official value for Chinese National Currency was $12,000 for one U. S. dollar; open rate was 72,500 to 1; the black market offered 160,000 to 1.

Below us sprawled numerous lakes, some large, some small. From heavy rains and the summer rise of the rivers many dry-season farmlands were covered with water.

For half the way toward Ichang we could see the long, lazy loops of the Han, largest tributary of the mighty Yangtze.

Nearer Ichang we again spotted the Yangtze off to our left. As we sped over the town, we saw its yellow waters, fringed with junk masts and dotted with several river steamers.

Close to the town the plain ends abruptly. The Yangtze becomes only a gash in the mountains. From here on we rode above its twisting path, cut through the bold hills.

Swinging first one way and then the other, we passed awesome gorges in rapid succession. Only minor breaks in the mountain walls separated one gorge from the other.

First came the Ichang Gorge with its towering cliffs of bluish-white limestone. Next were two rocky constrictions known as the Ox Liver and Horse Lungs Gorge and the Soldier's Book and Sword Gorge.

A few moments later we were flying along the almost uniform mountain V which is the 30-mile-long Wushan, or Witches, Gorge (Plates II and VII). Shortly thereafter we kinked around a sharp zigzag turn where lofty vertical-walled peaks squeeze the river into a narrow trough to form the Wind Box Gorge. Just beyond, on a low widened bank, clustered the rooftops of Fengkieh (Plates I and VI).

Through some of the gorges and in boulder-strewn stretches we could see swift waters eddying and frothing. Against them scores of tow men hauled their boats. Others sailed the brown band of the river. The upstream junk voyage from Ichang to Chungking takes anywhere from one to two months.

Above Fengkieh the Yangtze trench is less restricted. Lower hills bracket the river and

the high, craggy ridges rear a short distance away.

Much of the rest of the way to Chungking we flew above contorted hills, over whose slopes spread an amazing patchwork of farms (Plates IV-V).

Fog over Chungking

The afternoon sun shone in our eyes as we slipped over a mountain ridge and saw the black smudge of Chungking sprawled beneath a layer of haze.

Sunshine over the city is the exception, rather than the rule. For months of the year fog and clouds hang over the rivers and hills. That, plus the fact that the Chinese painted the town black, kept the Japanese from bombing it more than they did.

"We often have to do some fancy flying to get in," commented the pilot. "See that island down there in the Yangtze? That's where we usually land."

I saw only a tiny bare patch just above the water level. My expression must have asked the question.

"No, we're not landing there today. Two weeks ago the island was under 50 feet of water," he added. "Buildings we had there were carried away. In summer flood season the river sometimes rises 100 feet here."

We taxied down on a field farther upriver.

To keep its feet dry, Chungking perches at impossible angles on the high hill spur between the Yangtze and Kialing Rivers at their junction. Its satellite town, Kiangpeh, and other suburbs cling to the slopes on the opposite banks of the two rivers.

Unlike Shanghai, Hankow, or even Nanking, this historic trading center is Chinese, body and soul. Here are remnants of ancient Chinese walls, venerable pagodas, and a clustered confusion of mud and bamboo homes clinging to the sharp hills.

The Chant of the River Men

Prior to 1927 there was not a single wheeled vehicle inside the city wall and few streets wide enough to accommodate them.

But gradually new roads were cut, though some are still unbelievably steep for the rickshas, buses, and few private cars. The city also got electricity and water.

Nearly 40 Feet of Water Today!

A quick glance at this high-water mark painted on the white limestone cliffs tells the Yangtze pilot the depth of the river in Ichang Gorge. He can then judge the clearance over rocks, strength of rapids, and choose the safest channels for his vessel.

For 1,500 Miles, from Chungking to Shanghai, the Author Followed the Yangtze

High mountains, spectacular gorges, and seething rapids lie between Chungking and Ichang. River junks and sampans often take one or two months to negotiate the hazardous upstream trip. Dozens of men haul their craft by brute force up turbulent stretches. River steamers are specially powered to breast the flood.

As I puffed up and down its pathways, however, I saw hundreds of people climbing the seemingly unending flights of steps with their heavy wooden buckets of muddy Yangtze water slung on carrying poles (Plates III, VIII, and page 326). With good reason, too, I paused to listen to the chants of the tow men hauling loaded junks along the river.

During the war countless homes were burned or demolished by bombs. Many were quickly rebuilt. I saw others under construction. A framework of poles was raised and the sides covered with bamboo. Laborers smeared plaster over the walls and the structure soon had the appearance of solidity and durability.

"In prewar days Chungking had a population of perhaps 600,000," said my companion. "It grew to more than 1,000,000; so you can guess what a job it has been to get people out once the war was over.

"Planes and steamers have been packed, and one of the biggest industries here now is building river junks to carry more people and goods back downriver" (Plate X).

Thanks to kindly officials, I got passage on the S. S. *Ming Lien,* one of the larger upper-river steamers, designed to carry 200 passengers and crew.

We went aboard at the foot of one of Chungking's eternal flights of steps. It was a good ship, but why so few passengers, I wondered, as the lines were cast off. Only about 50 persons had come aboard.

I hadn't long to wait. We dropped anchor near the opposite shore and soon were surrounded by swarms of boats loaded with soldiers. Late that afternoon and until after dark they came with full gear—some 1,800 men in all, and 50 head of horses!

Aboard a River Steamer

No sardine can was ever packed tighter than the *Ming Lien* when we weighed anchor and slipped downstream at dawn.

Mist lay over the river, but the hot summer sun soon burned it off. I climbed a ladder to the roof above the bridge deck to gain a more unobstructed view.

Bowling along on the swift waters, we passed many river junks and large sampans under sail or being towed upstream.

Only when I saw some boats standing seemingly immobile in the water, even though dozens of bare-backed men bent and strained at the towlines, did I realize the tremendous sweep of the rapids.

Some spots in the Yangtze form treacherous rapids at low water; other stretches become

Drawn by H. E. Eastwood and Irvin E. Alleman

200,000,000 People—Nearly a Tenth of the Human Race—Live Within the Yangtze Basin

Source of this busy "Main Street" of central China is in the lands north of Tibet (inset), more than 3,400 crooked miles from Shanghai. During the war the Chinese Government retreated from Nanking and Hankow upriver beyond the mountain barrier to Chungking. The capital has been re-established at Nanking.

hazardous during middle or high-water levels. In these whirlpools and seething waters navigation becomes ticklish business.

Graveyard of Junks

Roughly, one out of every ten junks is badly damaged on the trip between Ichang and Chungking. One in twenty is totally wrecked. Occasionally even a steamer piles up on the rocks.

Along the banks and on several rocky spits we saw damaged boats being rebuilt. In some places, too, new ones were under construction.

A glorious panorama of lofty blue-green mountains, uptilted farmlands, and river villages unfolded before us as the steamer sped along on the yellow flood at a good 15 knots. Within little more than two hours we had come abreast of ancient Changshow.

An hour and a half later we picked up Fowling, at the mouth of the Kungtan tributary. Along the water front I saw a number of *wai-pi-ko,* or crooked-stern junks, for which the Kungtan River is famous.

These boats look as if they had been caught between rocks and some freak whirlpool and had their hulls twisted. One side bulges more than the other, and the stern leans heavily to starboard. So lopsided are they that a sort of "flying bridge" is added for the steersman, who handles the long heavy sweep attached to the high corner of the stern.

One explanation for their twisted shape is that it helps negotiate the turbulent rapids on downstream voyages.

Tobogganing over waters that raced between dangerous reefs and looped around wide river curves, we cruised on to Fengtu.

Passports to Heaven

I should have liked to stop and climb its Mount of Heaven, for atop its wooded hill of Tientse Shan stands a weathered temple. It is dedicated to the god of Hades, but here devout pilgrims may secure passports to Heaven!

The documents, it seems, are highly prized, but the catch to them is that, to be really valid, they must also bear difficult-to-get signatures and be marked with the imprint of the seven stars of the Great Bear.

As we coasted past prosperous-looking farms toward Chunghsien, the cabin boy who had taken me as his personal charge sought me out and announced happily, "Master, I catch you chow now."

Where he had "caught" it I didn't know—perhaps from the crew, or it may have been

In Chinese, English, and in Pictures This Nanking Dairy Advertises Its Business

Here, say the characters, is sold fresh milk from thoroughbred cows and Swiss goats. Such dairies are still rare in China, and pasteurization plants almost unknown. Efforts are being made to improve herds and to provide customers with a sanitary milk supply.

his own. I crawled down the ladder and elbowed my way to my cabin.

Many soldiers looked on hungrily as I chopsticked my way through a big bowl of rice, a dish of vegetables and meat, and topped it off with a soup. I clambered back to my roof perch.

In midafternoon we came to Shihpaochai, or "Precious Stone Castle," a striking landmark on the Yangtze. In a sharp kink in the river a vertical-walled column of rock towers some 200 feet above the village that sprawls at its base (page 330).

Later in the afternoon we cascaded over several races and turbulent rapids in gorge-like hills as we neared Wanhsien. Just after shooting Fu Tan (rapid), where the heavy volume of the Yangtze is squeezed in between huge reefs and boulder promontories, I saw a graceful humpbacked bridge arching like a rainbow over a side stream.

A still more spectacular one once linked Wanhsien with its suburb across a rocky ravine. It had a building atop its almost semicircular arch. Apparently it had grown weak with the ages. A modern bridge now spans the gorge.

Wanhsien, the Myriad City, is beautifully set on a hillside. Beyond the notch formed by the gorge and the vale which extends back of the town rise high green hills and a series of craggy peaks (Plates IV-V).

We rode on another 20 miles and tied up for the night beside a steep sandbank beyond Eight Cliffs Gorge.

Once the ship was warped in close to shore, sampans appeared out of nowhere and took scores of soldiers ashore. In young moonlight many stripped and bathed in the river. Others kindled fires and began cooking caldrons of rice.

Through a Risky Rapid

When we cast off next morning just after dawn I soon learned why we had halted where we did. Only a short distance beyond was the Hsinlung Tan (rapid). There the river swirled, eddied, and rushed as if through a giant sluice. Several junks lay just below the rapids, some already with their towlines out, making preparations for mounting this tough upstream step.

In midmorning we anchored at the foot of the old walled town of Kweichow, or Fengkieh, popularly referred to as Kueifu. Here the soldiers gathered up their equipment and got off. One skittish horse caused a brief flurry of excitement when he protested walking the plank ramp. At last he leaped forward, sent the planks flying, and fell with a splash into the water. The lad at his bridle clung to him and both soon floundered ashore.

Thick gray walls encircle Kueifu, the old city of kings. In their weathered condition they bear the timeless flavor of ancient China. In the vicinity, however, are remains of the still earlier stronghold of Peiticheng, "White Emperor's City," whose roots were implanted in the rocky land 1,700 years ago.

Kings and feudal lords chose to settle here because it lies protectively just within the inner portal of the mountainous gorges that reach all the rest of the way to Ichang.

Just below the city the Yangtze squeezes between a vertical wall of rock and a majestic mountain, which soars 1,800 feet above the river.

Geologists may have one explanation as to how the river carved its path through the bold mountains that pile high in the region. Legend has another.

Wizard Wu-tze Blew Wind Box Gorge

Some 3,500 years ago Yu-wang, the god of the rivers, sat on a mountaintop directing the course of the waters. But here the mountains resisted him, until the wizard Wu-tze came to his aid. With a furious blast of wind from his nostrils Wu cleaved a path through the rocks and thus opened the Fenghsianghsia, or Wind Box Gorge!

Even Wu's mighty puff, however, failed to cut a straight path, for the river surges around sharp bends between the frowning cliffs. We rode its twisting chute of water at a dizzy pace.

A boat trackers' path has been carved along the rock wall high above the sweeping waters. It seemed a precarious, narrow footing indeed for the trackers, who haul their junks upstream with long, twisted bamboo hawsers.

We safely negotiated the five exciting miles of Wind Box Gorge in a few minutes. Beyond it the mountains broke away, but the river passage still was spectacular (Plate I).

Nowhere here did old Yu-wang, the river god, have an easy time carving the river route. Only a few miles downstream he again had to enlist the assistance of the Paul Bunyanlike wizard, Wu, when he hewed the awe-inspiring trench of Wushan (Witches) Gorge (Plates II and VII).

Just after passing Wushan, perched on the left bank (as, oddly enough, are most of the towns on the upper Yangtze), we plunged into the steep-walled canyon.

In backwashes and in the lee of reefs along the way junk crews awaited our passing before they began hauling their heavy craft over the rapids. Other boats, with big sails set, were riding calmer stretches on an upriver wind.

Water in the river was running at mid level;

we steamed through many races, whirlpools, and eddies. Here in the Wushan, when summer waters are at their height, the whole river becomes a gyrating torrent as its immense volume strikes one wall, then the other.

When "freshets" come, the waters in the gorges may rise as much as 50 or 60 feet in a single day. As these quick floods pile up in the bottleneck passes, not only junks but steamers as well have to tie up and wait for the torrent to subside.

In some of the gorges the high-water peaks have been measured at more than 200 feet above normal low-water level!

After leaving Wushan Gorge astern, we entered a more open region, but the river continued to brawl over numerous rapids. Only a few miles ahead more mountains closed in and seemed to choke off the river entirely.

Soldier's Book and Sword Gorge

Later we slid into the deep shadows of Soldier's Book and Sword Gorge. Perhaps it was the sudden gloom cast by the overpowering cliffs that made this defile seem more dramatic than the other gorges.

Just before we had entered the 3-mile-long mountain cleft I had seen scattered clouds rolling over the peaks. Hardly had we cleared the gorge and the dangerous Hsin Tan (rapid) just below it when a blinding downpour burst upon us with all its fury.

The skipper hove in toward shore and anchored. For half an hour the rain and wind roared through the mountain gap. Then as suddenly as it had begun the storm ended.

Another half hour was lost in freeing the anchor, which had lodged beneath a rock. Once clear again, we swung downstream in bright sunlight.

Almost immediately we cruised into the 4½-mile-long Ox Liver and Horse Lungs Gorge and then cascaded over the dreaded Kungling Tan (rapid), where a gigantic rock divides the river.

The next 16 miles of the river are beset by rapids, reefs, cross currents, and whirlpools. Yaochanho, meaning "Crooked River," Chinese rivermen call this boulder-strewn stretch of the Yangtze. At no season is navigation safe here.

The late-afternoon sun was already casting a golden light on the white and gray limestone peaks and fantastically eroded spires when we rode into Ichang Gorge. Dusk had gathered when we emerged from the 15-mile channel through the mountains and came to Ichang.

I found what remained of one of Ichang's two hotels in the blackness of night.

It was a sorry-looking town that I discovered next day when I roamed through the streets. The Japanese had first bombed it and then later had torn down many buildings for wood when they came to occupy it.

Many of the people who had lived there had retreated into the mountains or scattered in outlying villages during the Japanese occupation. Now they were coming back and were repairing battered structures or were building temporary homes.

Plans for a Mighty Dam

Some of the people here are talking about even greater days for the future. In their mind's eye they picture a thriving city, not just a river-port town where goods are transferred from deeper-draft steamers that ply the lower and middle Yangtze to shallow-draft upriver steamers or junks.

The transforming magic would be the erection of a mighty dam across the Yangtze. Nor is the possibility pure fantasy.

Already preliminary surveys and plans have been made for harnessing this largest river of China by building a dam in the Ichang Gorge. The services of Dr. John L. Savage, who drew the plans for Boulder, Grand Coulee, and other dams, have been enlisted for the project.

Says Dr. Savage: "The Yangtze Gorge Project is unquestionably the most important hydro project ever conceived, when considered in relation to the untold benefits that will accrue to ancient but undeveloped China from resources of the Yangtze and its tributaries.

"With a normal reservoir water surface at elevation 200 it will develop 10,560,000 kilowatts of power. The project will provide water for irrigation of 10,000,000 acres of good agricultural lands, and sufficient flood storage to control the largest flood on record.

"Also, the project when supplemented by navigational facilities will permit ocean-going vessels to ply inland at least to Chungking. It further will furnish clear domestic water for many cities and industries."

It is an ambitious scheme on a scale never before tackled. The dam presents unprecedented problems, and special means must also be used in lifting steamers over the dam. But, gigantic as the task is, Dr. Savage considers it entirely feasible.

While pondering such a grandiose plan for the future, I embarked on a crowded downriver steamer which towed two overflowing barges lashed on either side. Soon I was again drawn back to the teeming life along the Yangtze today.*

* For additional articles on the Yangtze and China, see the "Cumulative Index to the National Geographic Magazine, 1899 to 1947, Inclusive."

Nets and Strings Keep Packages from Going Astray

During war years millions of Chinese retreated before the advancing Japanese. Afterwards they started trying to get back home. Mother and youngsters stand on a Shanghai dock awaiting a river steamer sailing up the Yangtze.

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Kodachromes by W. Robert Moore

A Young Chinese Philosopher Contemplates the Wide World about Him

The tot was helping his father spread out clothes and bedding to dry on the deck of their sampan home anchored in Soochow Creek. Everything had become damp and musty during days of rain at Shanghai (Plates XII-XIII).

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Kodachrome by W. Robert Moore

A Crowded River Steamer, with Barges Lashed to Its Sides, Cruises Downstream from Chungking

After 1937, when Japan invaded the lower Yangtze, the Government withdrew to mountainous Szechwan Province. Now people and equipment are being returned. Small steamers shuttle between Ichang and Chungking most of the year; larger ones of 200-foot length halt during low-water months in winter.

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Kodachrome by W. Robert Moore

Nationalist Soldiers, En Route Between Chungking and Fengkieh, Crowd the "Sun Deck" of an Upper Yangtze Steamer

Holds and main decks of the ship, designed to carry 200 passengers and crew, overflow with 1,800 men, 50 horses, and their equipment. Following the Japanese defeat, the U. S. Navy made several trips through the gorges and rapids in LSMs. It turned over several landing craft to the Chinese Government.

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A Floating Town Clusters in the Shadow of Shanghai's Skyscrapers

It is drying day after a week of rain. Boat women spread blankets on the roofs in the sun. Fluttering clothes are threaded on bamboo poles so they will not blow away.

Kodachrome by W. Robert Moore

Soochow Creek Cuts Through the Heart of the Port City, Gateway to the Yangtze

Lighters are poled into this busy canalized creek to discharge drums of oil, cotton, lumber, and other imports. Other craft unload farm produce to help feed the teeming city of more than 4,000,000 persons.

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Kodachrome by W. Robert Moore

High on Purple Mountain, Outside Nanking, Stands the Mausoleum of China's Revolutionary Hero, Dr. Sun Yat-sen

Many Chinese tread the long pathway and 500 steps to the lofty terrace where stands the blue-roofed Memorial Hall and adjacent tomb. Dr. Sun died at Peiping March 12, 1925; his body was brought here four years later. The monument was designed by Lu Yen-shih, a Cornell graduate.

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Kodachrome by W. Robert Moore

Workers, Steamer Passengers, and a Medley of Goods Congest Shanghai's Famous Bund

Automobiles, buses, streetcars, rickshas, and bicycles course the water-front thoroughfare. The large-domed office is the Hong Kong-Shanghai Bank; next to it stands the Customs Building. Farther right rise the sharp-towered Cathay Hotel and the tall Bank of China. In the distance (right) looms Broadway Mansions Hotel.

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Kodachrome by W. Robert Moore

With Hand on His Mauser, ■ Nanking Sentry Guards the Archives Building

In this modern structure of ancient design are housed the records of the Kuomintang Nationalist People's Party.

Patent Plants Enrich Our World

By Orville H. Kneen

ONE spring day Charles A. Martin was strolling through his apple orchard in the historic Natchitoches country of Louisiana when he noticed a sappy twig which had broken from an apple tree. This tree's rather tasteless green fruit was no better than any other local apple. Nature, in the Deep South, has always been inhospitable to standard, or Yankee, varieties of *Pyrus malus*.

Moved by impulse, Martin stuck the twig in a soggy hole. About a year later he noticed that it had taken root, so he transplanted it.

When the young tree came into bearing, Martin began picking, to his surprise, not the green, ill-flavored apples borne by its parent, but early fruit of excellent flavor and color, suitable for cooking and eating. Nature, in a generous moment, had supplied the very apple he and his neighbors had wanted for years.

Plant Patent Act Spurs Enterprise

Unlike many people in the United States, Martin knew about the Plant Patent Act, so he patented this new apple. Thus he acquired by law the right to be the sole proprietor of the new tree, and all cuttings from it, for 17 years. The law permitted him to license growers to propagate and sell cuttings, or grafted trees, and on every sale he could collect a royalty.

So Martin added his apple to a new and distinct class of "invention" which has taken its place among the millions of patents on file in the United States Patent Office.

Some of the inventions in this category are unique; some are extremely valuable, bringing as much as $10,000 for patent rights to a single plant. Such inventions are changing the aspects of our gardens. Others seem destined to alter some of our eating habits, and may extend fruit-growing areas by making trees more resistant to cold and disease.

Under patent law there always has been a "process" type of patent for use of fruit growers and farmers. As early as 1864 an Ohio man obtained a patent for his "process for retarding the bloom of fruit trees."

But the Plant Patent Act of 1930 was something new and different. It enabled Martin to obtain a 17-year patent on *the apple tree itself*. To obtain the patent, he had only to convince the patent examiner that his apple was a "new and distinct variety" and that it had been introduced to the public less than a year before his filing of the application.

The patent Martin received 13 months later included a four-color reproduction of a color photograph which his attorney had had made from a specimen apple (Plate VI).

Whether he was to make money on his patent, Martin realized, depended on how well he stood with the gods of business and good fortune. A new fruit variety must be tested, and often may require 20 years to determine its adaptability to various areas, its resistance to disease and insect attack, and its ability to produce good fruit regularly.

A Challenge to Growers and Amateurs

The truly unique law of 1930 provided a strong incentive to growers to be alert for Nature's "budsports," or chance seedlings, and also to develop their own hybrids. Any new variety, duly propagated, may be the basis for a valuable patent.

The widely known Delicious apple was a chance seedling. From a peach pit planted some 75 years ago originated the Elberta peach. The grapefruit is believed to be a natural mutation of the coarse-fruited shaddock.

Amateurs with sharp eyes have the opportunity to spot in their own gardens a sport worth patenting. Or they may find it growing wild in a field or in the woods.

Thus a picker in a Washington State apple orchard found a fine apple with four clearly marked segments, each different in color and flavor. But the grower never was able to locate the branch on which it grew. Perhaps he lost a fortune, because a "built-in" trademark like that would be observed and remembered by everyone.

At the Patent Office I learned that patentable characteristics may include: unusual habits of growth; relative immunity from disease and resistance to cold, drought, heat, wind, or soil conditions; color of flower, leaf, fruit, or stem; productivity, including everbearing qualities in fruits; storage ability of fruit; perfume, form, and other flower qualities; and ease of asexual reproduction.

I found a good explanation of the last-named term in the "case of the foreign heliotrope."

Growing a Blackish Heliotrope

In Guatemala, Quincy A. Shaw McKean found a heliotrope unlike any he had ever seen. He brought back to the United States several hundred seeds and planted them.

Three grew. Each seedling differed from its mates and from the mother plant. He

Staff Photographer Willard R. Culver

Is There "a Rose by Any Other Name" That Looks Like This?

Lawrence J. Blackmar, an examiner at the United States Patent Office, conducts a search to determine whether a new rose variety is patentable. Features which may be patented include unusual habits of growth; relative immunity to disease; resistance to climatic conditions; productivity; color of flower, leaf, or stem; keeping qualities; perfume and form; and ease of asexual reproduction (page 357).

never was able to induce seeds from these three seedlings to grow, but he did "asexually" (or vegetatively) reproduce the plants by slips or cuttings that quickly took root.

Selecting the best progeny, he destroyed all the others and applied for a patent, claiming the darkest-colored heliotrope known, a blackish violet outdoors. Other qualities included unique foliage, the large leaves having a peculiar suffusion of a violet-green shade.

McKean could not have patented one of his seeds. No patent is issued on seeds, or on vegetables (except one on a mushroom), or on any plants that grow only from seeds; or on tuber-propagated plants (potatoes or Jerusalem artichokes). A new variety propagated by layering (grounding and rooting a growing vine or runner, often done with berry bushes and strawberries), also is patentable.

Nor could he have patented merely an imported plant. Prior to his application he had to reproduce it asexually, thereby establishing its adherence to its mother type.

Plantsmen agree that this kind of plant creation is simple, even for the amateur, and that it often may be exciting. It is all too rare in our gardens.*

Of the more than 750 plant patents thus far granted, about half have been on roses.

Nearly 75 percent of some 175 patents on edible plants and products are on fruits that belong to the rose family—the Rosaceae—which includes apples, peaches, nectarines, plums, apricots, pears, cherries, and berries.

Farmer Yerkes's "Gift from Heaven"

Many of today's improved fruits—better-flavored, larger, better keepers, grown on more productive, hardier, or more resistant trees or bushes—originated as chance seed-

* See "The World in Your Garden," by W. H. Camp, National Geographic Magazine, July, 1947.

Staff Photographer Willard R. Culver

For a Plant Drawing, Her Grapes Must Be True to Color

A Washington, D. C., artist paints a water-color sketch of an improved variety of grape, to accompany the patent application. Since color often is one distinctive feature on which a patent claim is based, extreme accuracy is required. Use of standard color charts helps the patent examiner determine the exact shade.

lings, or sports, Nature's sudden, mysterious deviations from type.

"It could happen to anyone," said William F. Yerkes, a farmer who lives today near Rio Oso, in Sutter County, California. One day he found a peach seedling, origin unknown. It had sprung up near his kitchen door, a good place for a shade tree, at least. So he pruned and cared for it, and in its fourth summer it bore large yellow freestone peaches that reminded him of the Crawford, but were even better.

"I found it was an extra-fine peach, superior to anything I had known," he recalled. "So I decided to propagate it for a small trial orchard. There the vigorous young trees, with short stocky limbs, came so loaded with fruit that I had to thin them heavily. They never suffered from frost, while neighbors lost on other varieties."

His first 75 trees began bearing in 1930, the year the Plant Patent Act was signed by President Hoover.

In 1932 he made out his patent application, in which he recorded that the high-quality, well-colored fruit had a slightly spicy flavor, even when it was picked hard for shipping. Also, it matured at a time when no other good yellow freestone was on the market. He received his patent a year later.

What to do with what he called his "gift from Heaven"? He decided to let an agent market the trees. With no fanfare, his trees have gone all over the land, to the extent of several hundred thousand. His small royalty per tree enabled him to pay for a modest farm.

Now, almost 87, Mr. Yerkes still runs the farm his peach seedling bought him.

Dr. David Fairchild's long and varied activities in plant exploration and introduction included, 20 years ago, an experiment that has its lessons for anyone interested in patenting a plant (page 374). Although it was before the days of such patents, the observations of so famous a plantsman about plant

Staff Photographer Willard R. Culver

Ribbon Binder Joins Patent, Painting, and Description in a Single Document

After plant-patent applications are approved, this United States Patent Office employee assembles the three sheets and puts them together for sealing (opposite page). Often 12 to 18 months elapse between filing of an application and granting of a patent. The procedure is the same as for other types of patents.

inventors and inventions may well have promoted the idea of a law to protect them.

Dr. Fairchild had imported two varieties of Actinidia and had identified their family relationship. The Japanese *Actinidia arguta*, a hardy and vigorous vine, had borne in California a soft, sweetish fruit of low quality and small size. The Chinese *yang tau*, or *Actinidia chinensis*, of which seeds had been sent to him by Dr. Ernest H. Wilson,* had produced in California a few large fruits with the tart flavor and size of a giant gooseberry.

The two varieties were growing at Wild Acres, Maryland home of Dr. Gilbert Grosvenor, President of the National Geographic Society, of which Dr. Fairchild has long been a Trustee. When they both burst into bloom one spring day, Dr. Fairchild conceived the idea of crossbreeding them. A successful hybrid might provide an abundant and useful new fruit, excellent for jelly and sauces, growing on a vigorous arbor vine.

Crossbreeding was successfully accomplished, and in October the hybridizer gathered the fruits of his invention. He inspected and tasted the large, firm, tart product. Then he removed some seeds and sent them to friends for planting.

This was to be the real test of the hybrid: Would it produce plants true to the hybrid traits of the first-generation fruits that tasted so good?

A number of seedlings did grow, some in foreign lands. But the dream of a fruitful Actinidia hybrid was unfulfilled. Every one of the seedlings refused to bloom or to reproduce, a failing that hybrids exhibit only too often. So a successful Actinidia hybrid remains for someone else to achieve.

However, Dr. Fairchild's conception, and his detailed record of every step in the process, may well serve as a model for the amateur who "dreams up" a new variety of flower, fruit, or ornamental plant.

Opportunities for Amateurs

For the amateur the field is wide and open. There are about 280,000 species of plants, including fungi, now known in the world, of which perhaps a tenth are used by man today.

* See "The Kingdom of Flowers," by Ernest H. Wilson, NATIONAL GEOGRAPHIC MAGAZINE, November, 1911.

There are flowers of surpassing beauty but rankly odoriferous. David Burpee, no amateur, developed an odorless marigold by sniffing thousands of blossoms and selecting plants with little or no odor.

A breeder of Nashport, Ohio, Anna L. Miller, found a gladiolus, usually odorless, having the one element that its beauty required. She patented her fragrant gladiolus.

Large flower growers seek novelties adapted to large-scale marketing, and when an amateur develops a very good variety of flower a big firm may buy it outright for a substantial sum. If future sales appear uncertain, the firm may prefer to pay the cost of a patent and give the patentee royalties, which often range from 5 to 20 cents a plant.

Today many growers and nurserymen pay for fruits that lengthen the marketing or canning season, or serve better for freezing or dehydrating.

Staff Photographer Willard R. Culver

Seal of the United States Patent Office Makes a New Plant Patent Official

The official seal is pressed over one end of the ribbon binder (opposite page). A final step in patent processing remains—the document must be signed by the United States Commissioner of Patents. The seal also is affixed to certified copies sent to courts in the event of litigation, or to foreign governments.

As a result of the arrival of spring and a study of the plant patent books of art, I have a dozen promising seedlings coming along in my peach nursery, a plot a few feet square to which I transplanted seedlings that came up from the residue of a year's canning.

I have also been told that my vigorous young black walnut tree, a chance seedling I brought home and stuck in a hole, will eventually grow me some good Persian walnuts (some call them "English") when I graft on the right stock. And I have a patented Blaze climbing rose coming along.

My rejuvenated apple tree last year had a nice crop. I'm looking it over carefully for anything resembling a sport.

It was the story of Lenton Newman that made me realize how generous a lady Mother Nature can be.

Nature Grows ■ Thornless Rose

This actually is the story of a tea rose, that ancient and universally loved Chinese immigrant that exudes the delicate fragrance of fresh, slightly crushed tea leaves.

One winter Lenton ("Spud") Newman, an east-Texas lad of 14, undertook with his father to grow roses on shares for a neighbor with a small business. The neighbor supplied them with several hundred rootstocks of hardy *Rosa multiflora japonica*, and the following summer he and his men aided the inexperienced

Staff Photographer Justin N. Locke

Golden-yellow, Pink-tipped "Peace" Was Born in France During World War II

Francis Meilland, famous hybridizer who developed this new variety abroad under the name of the Mme. A. Meilland Rose, is inspecting its successors, growing in the gardens of the Conard-Pyle Company, West Grove, Pennsylvania. When Mr. Meilland visited the United States last year, he saw his new rose was progressing in this country. Patented by the Conard-Pyle Company, it was an All-America Rose Selection for 1946 (page 377).

Newmans by grafting on to each thrifty root a cutting from the fine and widely known E. G. Hill rose.

By this method the world's best roses are propagated, many of them on this same variety of rootstock.

One day the Newmans were harvesting their modest crop of roses. A bloom without a single thorn was noticed!

They transplanted it to their garden. Two years later they had taken off 26 cuttings and grown them into plants about a foot high. The original was by now some 30 inches tall. It and every one of its progeny were as smooth as lead pencils.

Spud told his high school principal, who wrote to his Congressman and learned that it was possible to protect the find with a patent. In September, 1940, the principal introduced the lanky young Texan to A. F. Watkins, one of the leading southern rose growers.

Watkins was skeptical. But he drove home with Spud and soon was feeling the long smooth stems with their magnificent bright-red blooms. The astounded Watkins was convinced and bought all plants and rights for $250.

Sudden Freeze Kills Tender Plants

Nurserymen removed the top and limbs of the little plants, the roots not being dormant for harvesting. As Watkins viewed the small bundle of sticks, which could have been squeezed into a handful less than three inches in diameter, he regretted his deal.

A month later his experts had obtained enough buds to graft about 700 rootstocks in the field. Then, in another month, the balmy Texas climate slipped a couple of cogs. The temperature dropped to below freezing!

The tender new tops of the young plants, which had been forced into vigorous new growth, turned black from the ground up. Though dug up and replanted, not one grew.

Fortunately for Watkins, he had previously budded some of the new buds on rootstock safely inside his Dixie Rose Nursery. These grew, and in December, 1941, Watkins applied for a patent. He received it in September, 1942.

The previous fall he had displayed thornless blooms at the Tyler (Texas) Rose Festival and honored the event by naming his new rose the "Festival."

His first lot of 70,000 thornless wonders—all had come true to type—he sold to a wholesaler, who passed them on to a mail-order house. Then 200,000 more were ordered.

On December 7, 1944, Watkins sold out to the Krider Nurseries, Inc., of Middlebury, Indiana. For his patent rights and all his stock he received $10,000. No higher price has been paid to date for any patented plant.

The Krider people also paid him $1,000 for a single sturdy plant—a climbing rose that likewise had lost its spikes.

Protected by the Plant Patent law, the Kriders' two thornless wonders can be sold for no more than any good rose, which is much less than fancy new roses brought in prepatent days.

The only way a grower could make a profit on a new rose before 1930 was to build up, as secretly as possible, all the stock his capital permitted, then throw it all on the market at the top prices people would pay.

In a year or so, competitors would be building up their own stocks, grown from the no-longer-secret variety, now widely distributed.

Today buyers no longer have to pay $5 or $10 for a new rose, $10 for a new iris or gladiolus bulb, $20 for a fancy dahlia.

Each patented plant sold must carry a tag giving its patent number, which serves as a guarantee of its origin and assures fidelity to type.

Philadelphia Inquirer

Annual Rent for 5,000 Acres—One Red Rose!

Here little Amy Penn-Gaskell Hall, a descendant of William Penn, receives the payment from Miss Elizabeth Barbara Graves at West Grove, Pennsylvania, to satisfy terms of a title transfer from three sons of the founder of Pennsylvania to his grandson, William Penn. This traditional rental stipulation has been continued for 216 years. The Chester County Historical Society unveiled a marker at this presentation on September 6, 1947. The rose is a Mirandy, patented by the Armstrong Nurseries, Ontario, California (page 377). It was grown by the Conard-Pyle Company, of West Grove. Robert Pyle, president of the company, watches the ceremony.

Milton's Eden of *Paradise Lost,* with its "flowers of all hue, and without thorn the rose," might well have included some painless berry bushes (Plate VIII). Not till Luther Burbank's day did anyone set out to breed away the thorns, and it took the master breeder 30 years to grow a good-flavored blackberry on a thornless vine.

Only four and a half months after the Plant Patent law was passed, an application was made on a sport that had been found in a 10-acre patch of Young dewberries, or

youngberries. This was a vine that was entirely thornless and stayed so.

Later there was a thornless barberry; then a thornless Logan blackberry, or loganberry, found in a California garden; and a thornless hybrid, found in a thicket, that grew prolific crops of a new kind of berry.

But before a thornless variety can displace ordinary varieties, nurserymen say, it must be combined with prolific bearing, good flavor, and other qualities. Also, new strains must be adapted to growing in various areas. Superior thornless berries are still sought.

Golden Grow Some "Red" Apples

Chance selection has been improving the apple for thousands of years.

While Johnny Appleseed was spreading his cider-mill seeds all over Ohio, Indiana, and Illinois, young James Stark was riding west (in 1816) to Pike County, Missouri. His nursery, expanded by his sons and grandsons, soon began seeking and breeding hardier and more productive fruit trees. In 1894 the Starks discovered the famous Delicious apple, a product of a farmer's sport tree, and sold this variety by the million.

A Delicious apple tree limb that bore blood-red early fruit netted its New Jersey finder $6,000. A Golden Delicious, located on a West Virginia mountaineer's hill, was worth $5,000 to Paul Stark, fifth-generation seeker of new varieties.

Years later, after the Plant Patent law came into being (for which Mr. Stark is given much credit), the search for early reddeners brought the Starks a surprise—a red-skinned hybrid of Stark Golden Delicious. Frank A. Schell, Cashmere, Washington, hybridizer, who originated this new apple, received $7,500 for his patent rights, highest sum paid for any fruit up to that time.

Limbs or chance seedlings of apple trees accounted for 20 out of the first 26 apple patents. Improved types have been planted in Illinois, California, Virginia, Michigan, and Tennessee. One Delaware patent protects a cooking-eating apple that ripens two weeks earlier than Yellow Transparent, earliest on most markets.

By a combination of natural sports and careful breeding the fruit industry continues to let out its belt, extending the growing areas far into Canada, into parts of Alaska, and south to the Gulf.

Ever since Samuel H. Rumph planted a Chinese seed in his Georgia orchard and raised the first Elberta, this variety and others, like the yellow Crawford, have shown ambition to improve by means of natural sports.

More patents have been issued on peaches than on any other plant except the rose, and three out of every four are sports or chance seedlings.

Middle West growers have been seeking cold-resistant peaches for more than 40 years. Some varieties recently patented have withstood 20 degrees below zero, then have bloomed and borne fruit. In Queenston, Ontario, a small limb produced ripe peaches when all the rest were still green, beating Elbertas by six weeks. In British Columbia an early variety of Rochester was found and patented.

After 40 years of research, California in 1947 had varieties which enabled it to grow 40 percent of our commercial peach crop.

One variety (Plate IV), the patent on which was assigned to the Armstrong Nurseries, Ontario, California, has borne 50 to 100 peaches only 15 months after being planted as a knee-high switch. Another grows top-priced fruit ready for market before the first of June.

$10,000 for a Peach

Not long ago, J. Frank Smith, Arkansas orchardist, found a freak limb on his July Elberta (a Burbank creation patented after the master breeder's death). Smith's limb ripened three weeks early, and the Starks recently contracted to pay him $10,000 for his patent rights. To date, that is tops for a patented fruit tree.

A Virginia researcher, Dr. F. W. Hofman, after years of crossing and recrossing, bred a peach with winter hardiness and other qualities, including "plumlike, waxy, and smooth or non-fuzz skin." It may be classified as a true nectarine—a peach with a smooth skin.

We have had the fuzzless peach for many years, but its delicacy makes shipment difficult, and the tree is highly susceptible to diseases.

Of the eight nectarine patents, four are on sports. One is for a tree that grew from some peach pits thrown out of a garden. Several grew into peach trees, but one produced yellow-fleshed nectarines.

The patent was assigned to the Agricultural Experiment Station at New Brunswick, New Jersey, where a second generation of this tree grew much larger fruit than its parent.

Plums and the Patent Law

Harry C. Robb, Washington, D. C., attorney credited with conception and final achievement of the Plant Patent law, told me the idea

Pale-yellow Petals, Carmine-blotched, Make This Spanish Rose Patentable (Plate I)—→

Sept. 29, 1936. P DOT Plant Pat. 197

ROSE

Filed March 16, 1936

Inventor
Pedro Dot

By Robert Robb
Attorneys

Aug. 23, 1932. R. L. CATRON Plant Pat. 23

ROSE

Filed Jan. 16, 1932

ROBERT L CATRON,
Inventor,

Victor J. Evans
Attorney.

ROSE PLANT

Filed April 13, 1942

WITNESS

Addison E. Avery

George Janssen,
Inventor,
by Rummler Rummler & Davis,
Attorneys.

From "Better Times" (Plate II) Came This Sport of Variegated Hues

PEACH TREE

Filed Nov. 27, 1943

Inventor
Walter E. Lammerts

By Robb & Robb
attorneys

A Babcock and "July Elberta" Cross Produced These Bigger, Tastier Peaches
Heavy Yield, Hard Fruit Are Strong Points of This Sweet Cherry Hybrid (Plate V)

Sept. 17, 1940. H. B. FABER ET AL Plant Pat. 421

CHERRY TREE

Filed April 18, 1940

Inventors
H. B. Faber
J. a. C. Zigler Jr.
By Robb & Robb
attorneys

Jan. 5, 1943. C. A. MARTIN Plant Pat. 564

APPLE TREE

Filed Dec. 2, 1941

Inventor
C. A. Martin
By Robb & Robb
Attorneys

By Chance an Orchardist Grew This High-quality Apple in Louisiana

Dec. 10, 1946. A. CUMMING Plant Pat. 718

CHRYSANTHEMUM

Filed Jan. 2, 1946

INVENTOR
Alexander Cumming
By Orville M. Kile
plant pat. Agt.

From a Connecticut Nursery Comes the Scarlet Pompon Chrysanthemum

March 9, 1943. M. B. CRANE Plant Pat. 571

BLACKBERRY PLANT

Filed Oct. 20, 1942

Inventor
M. B. Crane
by Robb & Robb
Attorneys

Boon to Pickers—a Thornless, Long-bearing Blackberry Plant

came to him some years before 1930, when he was denied even trade-mark protection on a plum evolved from years of hybridizing. He concluded that a special patent law was the only solution for the plant inventor's problems.

Burbank died four years before the patent law was passed, but his fame as a pioneer hybridizer doubtless helped to obtain passage of the law.

Perhaps nothing would have pleased the plant magician more than to know that five patents were issued in 1932 on some of his finest plums, fruit of more than 40 years of breeding that had seen creation of some 60 new varieties of plums.

Paul Stark, whose family firm is carrying on Burbank's research, told me that its aid to the famous hybridizer could have been greater had there been a patent law to protect its investment in developing new varieties. Royalties paid Mrs. Burbank, he added, total nearly $50,000 and will continue for years.

Burbank and other hybridizers made the plum a valuable fruit for California and later for Oregon and Washington. But in most States it is still a delicate tree and offers a luscious target for plant inventors.

Apricot Is a Delicate Immigrant

The apricot is not yet perfectly at home in this country, though it has been known for more than 4,000 years. Today it challenges our inventors by coming into bloom just as spring frosts are due.

Seeking a hardier apricot, Burbank crossed it with the plum; his "plumcot" was one of the early indications that crosses between different genera could be made.

Some 25 years ago began the importation of hardy types from northern Asia, Japan, and Europe in a systematic program to foster real hardihood. A Minnesota man has patented a variety which, grafted on a hardy hybrid plum root, withstood 47° below zero.

Another need is good keeping quality. California grows up to 90 percent of the Nation's supply; Washington most of the remainder. By far the greater part is canned. Improved varieties would greatly increase the consumption of this fruit, which is truly delicious when tree-ripened.

Mouth-watering but unacclimated, the Bartlett pear is a prey of fire blight and other enemies; so today most of this luscious fruit is grown on the Pacific coast, where cooler and dryer summers keep down the blight.

Hybrids with a Chinese pear as one parent are more resistant but not of top eating quality. Not long ago Nature lent a hand by hybridizing a highly resistant Anjou on an Illinois farm. Another of the four pear patents was on a hardy seedling of unknown parentage at St. Louis Park, Minnesota.

In California a sport limb produced pears of dark reddish-brown color instead of the green hardy color. Buds were grafted on quince seedlings, then limbs from these were grafted back onto hardy pear trees. These produced a new and more marketable pear. A seedling of unknown origin, in Fairport Harbor, Ohio, produced a round pear with pink flesh.

Wanted: Hardier Cherry Trees

When Henderson Luelling, or Lewelling (later to be joined by his brother Seth), trekked from Iowa to Oregon in 1847, he carried along some cherries, from which grew the industry that today supplies most of our "sweet" varieties, such as Bing and Royal Ann (Napoleon).

The three Pacific Coast States supplied 82 percent of our 1947 crop, and seven western States supply the greater part of all that are grown for market. Even today the big sweet cherry that floods into far-western markets is a luxury in eastern cities.

Growers still seek early, hardy, productive, and well-flavored varieties, both sweet and sour. But our trees, progeny of those from mild parts of the world, often are caught by spring frosts. The hot dry summer in parts of the South is bad for them, and the humid areas induce brown rot.

Michigan, great sour cherry State, has had three patents, all based on sports. Two are early ripeners, one a late ripener. The late bloomer may escape spring frosts.

A hybrid sweet cherry developed in York, Pennsylvania (Plate V), is a prolific bearer of fruit that is hard even when fully ripe.

In all, eight patents, not counting an ornamental cherry with pendulous foliage, point to further extension of the cherry areas.

The Strawberry: Native American

The wild meadow strawberry of North America migrated to Europe about 1700 and there was wedded with the luscious Chilean beach berry. Our repatriated berry thrives from Florida to parts of Canada and Alaska. Literally tens of thousands of pure and hybrid strains are grown today. Experiment stations will test any new types that show promise.

Ten patents have been issued, to residents of States as far apart as Michigan, Maryland, Oregon, Massachusetts, Washington, Virginia, and Tennessee. Senator George D. Aiken, of Vermont, patented an everbearing berry that grew good crops both summer and fall.

Staff Photographer Willard R. Culver

In Jungle, Marsh, and Desert, Dr. David Fairchild Has Found New Plants

Here the distinguished botanist examines mango blossoms in his garden at Coconut Grove, Florida, where he constantly experiments with many useful plants he has collected on his world trips. In 1897 Dr. Fairchild was called upon by Secretary James Wilson to organize foreign seed and plant introduction for the U. S. Department of Agriculture. Fields, orchards, gardens, parks, and lawns all over the United States bear the impress of his work of more than 35 years. He has been a Life Trustee of the National Geographic Society since 1905.

All the citrus patents to date originated as sports. The first, in 1933, was for a seedless colored grapefruit, now grown widely in Texas and central Florida. This variety originated as a sport limb on a tree of Thompson pink, in Texas. Its colored rind is a natural "trade-mark." Red- or pink-fleshed citrus fruits are most common in the "desert" areas.

A seedless lemon was patented by a Californian in 1939. Another grower found a fruit combining the flavor of lemon and orange. In Florida a seedless pineapple orange was patented in 1941, and a seedless navel orange of unknown parentage but high quality was found in a small isolated grove. In 1930 a very early-maturing orange grew on a sport limb in the top of a Parson Brown orange near Dundee, Florida; it matured five to eight weeks early and was patented in 1945.

The Citrus Gold Rush

Today's citrus production has leaped to almost a third more than the 1935-44 average. In 1947 Florida, California, Texas, and Arizona produced 1⅓ boxes of citrus fruits for every man, woman, and child in this country. There is little doubt that the golden flood will rise steadily as more-productive varieties are planted.

Nine patented avocados, mostly based on chance seedlings, are available to improve our salads. Some have high oil content and nutty flavor. Oddly, this "alligator pear," though of high food value, cannot be cooked or canned. The avocado was one of the first fruits of the world-wide explorations begun by Dr. Fairchild and Barbour Lathrop in 1899.

More and Better Fruits and Nuts

Early-ripening grapes, others with high sugar content, still others that are seedless though they grew on a seed-bearing parent, give promise of increasing our huge crop of grapes. In 1947, 37 States grew grapes for market, and an improved variety might have wide appeal. Of last year's crop more than 43 pounds were marketed in some form for every person in this country.

Two patents have been granted on the fragrant and gorgeously colored mango, which is increasingly important as a crop. Dr. Fairchild grew scores of varieties, some of them chance seedlings. One patented mango produces fruit 11 inches long by 7 in diameter; the other produces a smaller but good-keeping and shipping fruit.

A Californian has patented a cherimoya. This tropical American fruit has been difficult to keep and ship, but the new variety is suitable for picking while immature, as it later ripens to its full flavor, a combination of pineapple and banana. Some of its fruits, weighing nearly a pound, have over 26 percent sugar content.

Sugar cane yielding up to 17 percent of the cane weight, and resistant to mosaic and leaf diseases, has been patented by Dr. Benjamin A. Bourne. With improved strains the Florida and Louisiana industry was saved from extinction and today averages more than 400,000 short tons of raw sugar per year.

Carpathian Walnut Thrives in U. S.

Usually, when we plant a walnut from one of our long-hybridized trees, it fails to produce a satisfactory tree. But when a walnut was brought from the Carpathian Mountain area of Romania's Bucovina (where a temperature of 50° below zero has been recorded) and planted in the Yakima Valley of Washington, it yielded annual crops of as much as 270 pounds of large, full-meated nuts.

The pecan, best of our native nuts, thrives naturally from Iowa to the Gulf. One patent was issued to a pecan specialist who spotted an unusual tree in a wild grove owned by an oil company. Permitted to take some buds, he grew a heavy-bearing variety. His tree blooms late, but its fruit matures early.

Nuts like these would add valuable crops to many a farm and garden.

Few plant discoverers have had more thrills than did a Tulsa, Oklahoma, man when he found the pendulous juniper. He had tried without success to breed a Rocky Mountain silver cedar with drooping branches. One day he saw a woodsman about to cut down a seedling that was "weeping" exactly as he desired. A limb was all he needed to propagate the graceful juniper he later patented.

Other finds and hybrids include an improved tobacco plant for Connecticut, a hybrid hop in Oregon, a hardy mock orange in Minneapolis. A sport dogwood found in Kentucky grows white flowers four to six inches across.

A Minneapolis man patented a grass which made a very tough, dense, and resilient turf. Traced to a probable sport on a strain of bent, it has proved to be a vigorous grower.

Some 30 years ago a chemistry professor, Dr. Ralph H. McKee, who was also chemist for the American Paper and Pulp Association, believed that some of our vacant lands should be growing lumber and pulpwood. But he found that the fastest grower of commercial pulp—the aspen, or quaking-leaf poplar—grew too slowly for a profitable crop.

Later, learning of the work of Dr. Augustin Henry, of Kew Gardens, England, he initiated and directed scientific research which evolved hybrid poplars, the best of which grew amazingly fast.

He reports that nearly half a million of his patented poplars now are growing more wood per year and per acre than any of Nature's varieties will produce outside of the South. With them owners of cutover land (one such owner has acquired half a million acres) can plant a crop that yields annual returns about as soon as does an apple orchard.

An Eden of patented flowers would be a riot of colorful and strange variegations, some bred by Nature, others by man. A blue African violet, when bred with a pink sport, produced a new pure-white variety. The same strange result came from crossing a pink geranium with a white-cream type.

A bright Castilian red carnation originated as a sport on a pink variety. But most of the 35 carnation patents are the result of careful breeding.

At the ornamental plant greenhouses of the Bureau of Plant Industry at Beltsville, Maryland, I saw hundreds of carnations of all colors being bred to obtain pure strains and to develop disease "tolerance" and other commercial qualities. Some grow to a diameter of five inches. The outdoor dianthus, a sister species, has been used in these hothouse hybridizations.

Giant Dahlias, 4-inch Pansies

Gigantic blooms, such as those of the freesia patented in 1946, have been the goal of some flower breeders. One dahlia bears 16-inch flowers, large enough for a sunshade, which grow on stems seven feet tall. Harold L. Ickes's patented dahlia grows blooms up to nine inches across.

Two greenhouse men in Westport, Connecticut, after years of breeding, obtained amazing pansy plants that grow three to five feet high. Each has from 10 to 15 stalks, bearing flowers four inches or more in diameter on stems 12 to 15 inches long.

These are used as cut flowers in season. They have been seen at the White House and at social functions in New York. A million

Staff Photographer Willard R. Culver

From This Graft an Apple Tree Will Produce a New Fruit

With a grafting tool the pomologist inserts in the limb a twig from a newly developed variety of apple. Taking life and strength from the growing stock, the twig will become a limb and will bear its new variety of fruit. Such grafting is done early in spring when growth has started in the stock to be grafted, but the twig is still dormant. Here at the Plant Industry Station of the U. S. Department of Agriculture, Beltsville, Maryland, improved types of apples are sought by careful selection.

blooms of this patented hybrid are sold each season. No seeds or plants are marketed.

Other unique flower patents include the widely sold pink delphinium and long-keeping gardenias. There are summer-blooming chrysanthemums, and varieties hardy enough for any winter.

The color of a new chrysanthemum (Plate VII) is claimed by the patentee to be "more brilliant and closer to scarlet than that of any other variety known to me."

A dwarf azaleamum grows only six to eight inches high. For window-box gardeners, two miniature roses from the Netherlands produce perfect blooms scarcely the size of a dime. One has a slight tea fragrance. A tiny peach tree that grows in a pot reaches only 30 inches when mature and grows real peaches. It first grew as a seedling in France.

To achieve long-lasting qualities in potted azaleas, the rhododendron, a closely related plant, has been bred with them.

Numerous and gorgeous are the new patented varieties of camellias, rhododendrons, hibiscus, water lilies, snapdragons, buddleias, poppies, geraniums, and poinsettias. There is a real need for flowers and ornamentals that thrive in the shade.

Roses Are Red—Why Never Blue?

Roses now come in every color and tint of the rainbow—save one. For her own private reasons, Nature has declined to give us a blue rose. The undesired bluish cast of a fading red rose is bred out by use of a slight yellow strain.

Nor has a "black" rose been found or bred, although long sought; a near approach is the deep-violet Nigrette, bred in Germany and assigned to the Conard-Pyle Company, patentees of numerous roses. In some lights Nigrette appears black.

Many of the 350 commercial varieties of the rose in use today are not patented.

The Better Times rose (Plate II), most propagated of all, gave rise to various sports later patented. Plate III is a highly variegated sport.

Better Times was a sport on a rose imported many years ago by E. Gurney Hill, founder of

the three extensive Hill concerns of New Richmond, Indiana. Hill, around 1900, found that hothouse roses—even the famed American Beauty created by George Bancroft, noted historian - diplomat — were becoming low in vigor and often were cut down by mildew. He began infusing the outdoor vigor of the wild rose into our indoor weaklings.

Finding a strong cerise-petaled sport, Hill hopefully named it Better Times, patented it in 1932, and then gambled everything on propagating 400,000 plants. With these and their innumerable progeny the country's florists shook off their depression blues and sold literally millions.

Henry A. Dreer, Inc., of Philadelphia, imported and patented Crimson Glory. Its blooms, with deep velvety crimson petals and carmine edges, are seen everywhere, and as a "dominating" male parent it is a favorite with breeders who desire rich coloring or red tints.

Staff Photographer Willard R. Culver

Waxy Compound Seals Air from a New Apple Tree Graft

H. H. Moon, associate pomologist, Plant Industry Station, Beltsville, Maryland, completes a grafting operation (opposite page) by painting the sawed and slit end of the limb. The sealing compound is not removed, and sometimes clings to the limb for three or four years until growth pushes it off.

Crimson Glory was one parent of a rose which became the most valuable plant patent of the Armstrong Nurseries. In 1935 they made a lucky cross of Crimson Glory with a yellow Sister Therese and obtained a beautiful seedling with cerise bloom.

As the Charlotte Armstrong, this variety won most of the national awards, and in 1941 scored the highest rating of All-America Rose Selections. This was after the usual two-year test in 18 test gardens of this country. The judges of this pre-introduction test are the most expert of rose fanciers. Anyone may submit a new variety for test under varied conditions.

The fragrant red Mirandy, which gained a similar award in 1945, is an offspring of Charlotte Armstrong. Both are steady "best sellers," and these two roses alone have earned more than half a million dollars for the firm.

In 1936 Francis Meilland, scion of generations of French rose breeders, began work on a hybrid seedling that by 1940 struck the Duke of Windsor as "the loveliest rose in the world."

Robert Pyle, who since 1907 has searched Europe for fine roses, brought this "Mme. A. Meilland" here in 1943 and patented it. Now known as the Peace, its unique "very double" bloom is a blend of delicate tints of yellow, pale gold, cream, and ivory, with a ruffled edge

Staff Photographer Willard R. Culver

A Dozen "Pink Bountifuls" Make Up This Dainty Wristpiece

Bunches of such patented midget roses often are displayed at flower shows in thimbles, or in tiny glass bottles. Several dozen make up a formal corsage.

of pink. Fully opened, it has a diameter of five inches or more (page 362).

Another Conard-Pyle importation (Plate I) is an oddly bicolored rose from Spain. The basic color is pale yellow, on which splotches of carmine may cover half a petal or even the entire petal. Rarely are two of these odd blooms alike, and the unique colors change as the blooms age.

Eugene S. Boerner, director of research for the world's largest rose growers, Jackson & Perkins Company, told me that patent control has given his company the chance to test its new creations, often for three years or more.

His latest, the scarlet-red New Yorker, has survived the tests of 80 "test station" growers from Florida to North Dakota.

Rose growing today is big business, for nearly 50 million are grown annually for florists and for garden use. Since the war's end, production has been tremendous. California sold $10,000,000 worth in 1947, while Oregon, Texas, Pennsylvania, and New Jersey together grew roses worth about twice as much more.

X-rays and Chemicals Cause Plant Mutations

Scientists foresee the day when increase of the human race may depend upon man's ability to develop food plants with maximum productivity and resistance to natural enemies. Equally necessary may be improved trees to produce our lumber, pulpwood, oils, and food products more rapidly.

Some hybridists and geneticists hope to cause new and beneficial changes in plants by solving present mysteries of the genes and chromosomes and their inheritance influence on living plants. These scientists are slowly mastering the use of "tools" for doubling or tripling the chromosomes, often producing mutations by heat and cold treatments, exposure to radiations such as X-rays, and application of chemicals like the powerful but poisonous colchicine.

Exposure of a regal-lily bulb to X-rays resulted in a mutation, a flower with peculiar anthers and other changes which persist in the bulbs that grow from the parent's bulblets.

No colchicine-treated plants have yet been patented, but experiments indicate that the doubling or tripling of chromosomes resulting from use of this drug, or from similar means, may lead to useful and desirable changes in plants. Such methods hasten Nature's processes and perhaps will lead toward plants far different from those of today.

The Romance of American Furs

By Wanda Burnett

In 1947 in the United States retail fur dealers sold an estimated $450,000,000 worth of furs. The pelts which fed this huge industry poured into the markets from all the fur sources of the world. They were swamp- and forest-trapped, home-grown and ranch-raised. They arrived as raw pelts and emerged as silky-textured warm fur coats.

The man with the trap starts this tiny bit of fur rolling along one of the most involved and confused paths in all industry.

From animal to finished garment these skins, moving along the processing trail, are repeatedly scraped of fat, graded, dressed, dyed, blended, and bleached. The fur is cut, sliced, matched, patched, let out, let in, stretched, nailed, squared, and stitched. Each operation may be done at a different place. Some may be combined in one plant.

Cheap furs are snatched from bundles and expertly made to resemble costly ones. Muskrats thus become "mink," "sable," or "seal." Raccoon and some sheepskin, each by a different process, emerge either as "beaver" or "nutria." Common rabbits get their stenciled spots and come forth as "leopards."

Costly furs are made more costly by a "let out" process of slicing the skins into thousands of pencil-thin diagonal strips and stitching them together again in a manner which lends grace and beauty of line to the finished coat but adds hundreds of dollars to the price (page 391).

Pelts Pass Through Many Hands

But even before these pelts reach the cutter's table or the stitcher's bench, they pass through many hands. The collector receives them from trappers and fur farmers. He scrapes off the fat overlooked by the trapper, sorts for size, color, and quality, and waits for the big city merchant to pick up from here.

These merchants are located in St. Louis, Seattle, Minneapolis, and other cities. Many are concentrated in New York City. Their representatives visit the collector, paw through the mounds of pelts, and ship the selections back to their city warehouses. Here pelts are again sorted and bundled, this time to suit the needs of the smaller city dealer.

Then dressers and dyers, magicians of the fur trade, begin to come into the picture. Many manufacturers who buy their skins raw send them to their chosen experts in this field to be processed before actual making of a fur coat begins.

Manufacturers are as varied in their interests as are the furs they handle. Not all of them make coats. And those who do, don't all make the same kind of coats. Some are strictly "sportswear" makers. Others create "dress coats" only.

Some make trimmings—collars, cuffs, or both. And the trimming trade is again broken down to include those who merely stitch together tiny bits of fur pieces into long strips known as "yardage."

Retail houses bulge under the load of coats which pour into their salesrooms. But again the wholesale houses supplying them are divided.

The greatest volume comes from quantity houses, which produce on a lavish numerical scale but keep well within the low-priced range. They push their wares along the assembly line at a frantic pace, making magic with rabbit fur and inexpensive lambskins.

Popular-priced houses make both dress and sport coats, take furs slightly above those of the volume houses, but send their products into retail channels which also aim to please the lady with the slim pocketbook.

At the head of the class is the style house, working in fine furs only and catering to the "one of a kind" customer. To protect their buyers against duplication, they sell not only the coat but the pattern as well.

This is the usual course of a pelt, but occasionally there are slight deviations. If the collector, for instance, is in need of cash, or anxious to clear out his stock to make room for more incoming pelts, he by-passes the big city merchants and ships to auction companies.

When I arrived in Milwaukee, the American National Fur Breeders Association was scheduling a sale of ranch-raised "sundry furs." Pelts had been pouring into the warehouse by the hundreds of bundles. They represented the trappers' catch and those taken from numerous Midwest fur ranches.

Attending a Fur Auction

The American National Cooperative Fur Auction was to be at a local hotel, but furs were being shown at a warehouse a few blocks away. Pelt previewing had been going on for several days. Buyers from New York, Chicago, and other fur cities had been crowding in with their catalogues, pencils, and notebooks.

I saw these men, white coats or dusters worn over business suits, wandering around in the furry forest of pelts. They eyed the skins from every angle. There were few exclamations and very little conversation.

Staff Photographer Robert F. Sisson

A New York Fur Runner Is Wrapped Up in His Work

This is Seventh Avenue, the Nation's fur capital, a block from Pennsylvania Station (center). More than 3,000 fur firms are crammed into the district. At lunch hour their workers congest the streets and vie with the trade's four-wheeled pushcarts for sidewalk space. Furs worn by intershop delivery men are so common they seldom get a second glance (page 383).

Auction showroom helpers took the bundles from the racks, lugged them over to the north windows to give prospective buyers better light and closer inspection.

The skins, hanging tail down from the tight-packed steel rods, were all numbered and registered. Their lot numbers corresponded with the catalogue numbers and would serve as the only guide at the auction, since no furs are exhibited at the sale.

They ranged in grades from "Tops" to "Bottoms." Some of the least desirable and mangy-looking fox pelts were classed XYZ—the lowest possible grade. Some were NTs, or what fur men call "No Types."

With nose firmly in hand, I gasped my way from bundle to bundle. The odor was so strong it was almost visible. When I reached the rack of beaver "blankets" hanging like huge overdone flapjacks, I was reeling. The beaver is by no means the only offender. Many commercially important fur bearers, including the costly mink but excluding the priceless chinchilla, have scent glands.

Fur men relish the smell. They call it "that money smell."

The smell meant money to old-time beaver trappers, too. Before the days of synthetic perfumes, castoreum from the beaver's two scent glands was saved and sold to perfumers as a base for many flower scents.

Beaver Helped Shape History

As I fingered the huge raw beaver pelts—coarse, unplucked, and definitely unlovely—it was hard to believe that this unattractive fur could have played such a part in American history (page 402).

To supply a fashion-hungry European trade with beaver for felt hats and stoles, traders, trappers, and explorers pushed their way into the vast untapped wilderness of the North American Continent.

The promise of "lands full of beaver" lured them along the Mississippi, the St. Lawrence, and into the Great Lakes region.

The beaver laid the foundation for the Hudson's Bay Company. It was the basis for John Jacob Astor's fabulous fortune. The second Pilgrim ship dispatched to England from American shores carried two hogsheads of beaver pelts and otterskins.

In some sections of the continent the man with the trap went in advance of the ex-

plorers and missionaries. Threading his way through dense woods and treacherous swamps, he left trails which later became routes of travel.

The Indian, who had trapped only to satisfy his own meager food and clothing wants, became a professional hunter when these white men filtered into his territory with offerings of axes, blankets, and trinkets for furs.

Beaver pelts became the "coin" of the times. Debts were paid and goods purchased on the "beaver standard." Six prime pelts bought a single woolen blanket. A musket stood upright brought in exchange as many flat pelts as the musket was high.

At sites of some old centers of the fur trade many of America's greatest cities have since been built. Where the Wrigley and Tribune Towers lift their heads high above Chicago's jagged skyline, weary trappers once repaired their boats before setting out across Lake Michigan for Mackinac.

Today Mackinac is one of North America's finest island summer resorts. In the days of the fur traders it was the headquarters for Astor's American Fur Company and the clearing-house for furs and supplies of the Northwest.

St. Louis, too, was once a fur-trading post, expanding as it became the base for expeditions into the Far West. San Francisco, Detroit, and New York City, all had their days as fur-trading centers.

Wide World from Press Ass'n

Selling Two Muskrats, a New Jersey Boy Earns $3.50

Amateur trappers, mostly landowners and farm boys, do much of the muskrat hunting in the United States. When snow stops crop work, the farmer's marshes provide a small winter income. In the fur trade, sheared and dyed muskrat skin is known as seal-dyed muskrat.

Beaver in the Raw

One of the men in charge of the American National Cooperative Fur Auction warehouse showed me why beaver in the raw has little resemblance to beaver as a finished product.

With a knife he began ripping out the coarse guard hairs from one of the pelts to expose the soft, downy texture of the underfur. This unhairing is still a hand operation and a highly skilled one. It was only one of the ninety-odd steps through which a beaver pelt passes.

These same stiff guard hairs, which fur-bearing animals produce primarily as a protection against moisture, were once the only hairs left on the pelt. The soft fur fiber, so highly prized today, was at that time carefully "combed" from the pelt for the plain and fancy headgear of Europeans.

The demand for these skins soon became a serious threat to America's resources. Hundreds of thousands of beaver pelts were being shipped out of the country every year.

Fortunately, a timely whim of fashion snatched these hats from stylish heads and replaced them with silk ones. As styles changed and other furs began to lead the fashion parade, the value of beaver pelts tumbled. Trappers began setting their bait for other animals and Nature was allowed a breathing spell.

Nowadays, in practically all States where beavers are still found, the seasons for taking them are closed, and the State Game and Conservation Commissions manage the taking of beavers. The annual crop is about 100,000 to 125,000 pelts.

Back at the hotel, the auction was about to get under way. Long rows of tables covered with stiff white cloths ran the width of the room (page 384).

Bidding Tense, but Silent

The auctioneer, the master of fur ceremonies, stood like a judge at his bench. Spotters, those alert men who mysteriously snatch unspoken bids from the audience, were spaced on each side. Unlike most auctions, the bidding was started by the auctioneer and began high. It toppled from the peak bid downward until some interested buyer took the bait, a spotter shouted "Up," and the sale was on.

A lift of a finger, a raised eyebrow, or a nod from a buyer indicated he had "upped" the bid. Prices were for one pelt only, but set the price for each pelt in the bundle.

Within less than an hour 3,000 mink went under the hammer. The top price for the day was $36 a single pelt.

By taking an average of $25 per pelt times 80—the number of skins generally used in a full-length coat—I figured that coat would cost in raw pelts around $2,000. And a raw pelt is many costly steps removed from the finished garment.

The electric numbers behind the auctioneer corresponding with the furs being offered rolled by so fast that I was always a few bundle numbers behind the bidding.

Early-day auctions were tense, too. Sales were by "inch of candle." A pencil-thin candle, bristling with pins, was set up at the beginning of the sale. As the hurried flame licked its way from pin to pin, bids were received. The furs went to the man who shouted his bid as the flame reached the last pin and flickered out.

The first platinum fox pelt was started at a high bid of $200. It tumbled to $96 before it was sold. Full silvers, half silvers, and quarter silvers were put up. Some of these I had seen at the warehouse—bedraggled, "thin," or "rubbed" XYZ pelts. They sold for 50 cents each.

The once popular red fox now is bought chiefly to be bleached and dyed to imitate its aristocratic brother—the platinum fox.

Skunks and raccoons were quickly disposed of, some of the poorer grades bringing as little as 5 cents per pelt.

Seventeen hundred beaver skins were dropped in less than fifteen minutes. The highest price was $76 and the lowest $60.

These were today's prices. Tomorrow's might be different.

Fur auctions have a language of their own. Bidders who wade in too deep financially are said to have "got their noses wet." The gentleman with the checkbook who bails them out is known to the trade as a "factorer."

If an auctioneer isn't getting his price, he buys them back himself by "taking a bid from the chandelier." "Prompt day" is the day of reckoning when the fur farmer, trapper, or collector gets his pay from the auction.

America's New Place in Furs

Before World War I almost all American furs were sent to Europe either for dyeing and dressing or to be sold in London or at Leipzig "fairs."

America was little more than a trader in the world's fur business. Millions of skins were exported, but none were dyed or dressed in this country. Formulas, usually secret, were locked in the minds of the men who handled them in Europe. America exported, Germany dyed and dressed, and London ranked as the largest seller of raw peltries.

With shipping curtailed, the United States began looking into its own dye vats. Dressers and dyers from London, Leipzig, and Paris were imported. Furs which had previously crossed the Atlantic to be dyed, dressed, and returned now stayed at home. Kettles boiled and bubbled. Dyeing progressed.

Alaska seal, formerly dyed only in London, became an American product, fine as any dyed abroad. Muskrats, usually sent to Austria and Germany for dressing and manufacturing, also became a "made in America" product.

Furs soon began piling up. Not only domestic, but imports from Russia, Japan, and China. A slump in prices for Canadian furs sold in Paris and London sent these streaming hopefully into American markets also.

And when shipping through the Suez Canal was blocked to the millions of Australian rabbitskins which normally poured through this waterway into Europe, these, too, began riding the Pacific toward American shores.

In 1911, pelagic sealing—the indiscriminate killing at sea of male, female, and pups—

Staff Photographer Robert F. Sisson

"Fashion" Dictates a Fleece-lined Windbreaker for Work in Fur's Cold-storage Room

Lampson, Fraser & Huth, Inc., a New York auction house, receives many pelts untanned and therefore subject to spoiling. A temperature of 15° to 20° F. preserves them indefinitely. Moths are controlled in some plants by raising the temperature to 50°, then plunging it suddenly below freezing. Speculators, buying out-of-fashion pelts, store them in cold, often for years, until an urgent demand sets in. Profits sometimes are enormous, losses often heavy.

was stopped in Alaskan waters. The United States Government took control. The pelts—taken from the three-year-old "bachelor" seals only—were shipped under Government control to St. Louis for processing and selling.

The mounds of fur grew higher and higher. Auction centers seemed to be the answer.

The first fur auction held in the United States was in St. Louis in 1913. In 1916 New York City set itself up as an auction center. But when the war ended, London once again recovered its fur position.

Later, when World War II swept over Europe, the auction scene shifted again. New York City reached out for first place, and St. Louis, once a strong leader and a great fur city, took second place. Milwaukee became an ambitious newcomer because of its location in the heart of the fur-farming section.

New York's "Fur City"

Many of the Milwaukee-auctioned peltries are shipped to New York City, where, in about five square blocks, some 90 percent of all the new fur coats for the entire United States are manufactured.

From Franklin E. Bump, Jr.

Not a Pelt Is Shown, Scarcely a Word Is Spoken; Yet This Fur Auction Throbs with Drama. Competition Is Keen

The American National Fur Breeders Association, a fur farmers' nonprofit cooperative, conducts the sale in Milwaukee. Its auctioneer, standing in the center of the sales block, starts the asking price arbitrarily high and proceeds downward until he gets a bid. On either side his spotters look for a nod or a lifted pencil. At the foodless banquet tables sit the buyers, watching their marked catalogues and the electric sign (right), which flashes lot numbers like a cash register. Before the sale they have inspected the actual furs, to decide how high to bid (pages 379, 382).

Staff Photographer J. Baylor Roberts

When It's Dinnertime on the Wisconsin Furring Range, Thousands of Phantoms Creep Out of the Forest and Haunt the Road

A moment ago a horse cart of the Fromm Bros. range delivered these silver foxes' daily pound and a half of meat apiece. Food pans, provided for sanitary purposes, are made secure lest they be dragged away. These fenced ranges near Hamburg hold 35,000 animals. Freedom is brief. November-December snows, which develop heavier, more valuable pelts, call the foxes to the last roundup (pages 393, 396-7).

© Genesee Mountain Fox & Mink Farms, Inc.

Why Shouldn't He Grin? His Pelt Is Worth $100

Various types of platinum fox originated at different times in Norway, Wyoming, Colorado, and eastern Canada. Colorado-Canada blend produced a sky-blue type called Geneseblu Platinum. This Genesee Farms specimen is two months old.

My introduction to New York's "fur city" came as I stepped out of the Pennsylvania Station one morning and turned south.

My entrance into the district was abruptly barred by a procession of dollies, or carrier carts, being pushed through the streets. Fox tails and whiskers, dangling from their metal rods, barely cleared the littered streets. Racks of gleaming black Persian lamb coats, silver fox jackets, moutons, and various others jolted past me.

Runners with rush jobs to deliver darted in and out of this fantastic parade (page 380). One held his prize—a choice beaver coat—high above the crowd and, to protect it further, he wore gloves.

Another ambled along carrying his "rush" and a greasy bag of doughnuts in the same hand.

Wearily came an old man, white coat crumpled over his suit, carelessly dragging his bundle of silver foxskins.

My eye scanned the windows of the tall buildings shouldering each other along Seventh Avenue. Their ads, all about fur, read like a classified section of a telephone directory.

More than 3,000 separate companies wedge themselves into this congested area extending south from 31st to 26th Streets with its outermost boundaries barely touching Sixth and Eighth Avenues. Its pulse beats more rapidly along Seventh Avenue, and the narrow streets which stem east and west for the most part house the smaller shops and dealers.

Into this small city within a city pour the furs of the world. Muskrats from the swamps of Louisiana, Maryland, New Jersey, New York, and other States. Sealskins from Alaska, wild mink from Canada and ranch mink from the thousands of United States fur farms. Beaver from Canada, Montana, and the Northwest. Sable from Russia, kidskin from China, Persian lamb from South-West Africa; and so on.

Between noon and 1:30 o'clock it is almost impossible to walk through this section.

This is lunchtime, but conversation is strictly about fur. Jobs are exchanged, bargains sealed, prices set. Frequently a runner squeezing his way through the mob with an order is stopped while some cigar-chewing curbstander fingers the pelts and comments to his neighbor about the quality.

Every shop carries its own signs of want or sale. Cards stuck in windows read: "We Have Alaska Seal," and "Mink Cutter Wanted." In windows where men stand hour after hour smoothing, shaking, and blowing into the fur of various pelts and matching them for color a sign boasts, "We Match Any Fur in the World." Another proclaims more simply, "Furs Matched."

Seventh Avenue ground-floor shops do business behind bolted and padlocked iron-barred doors. To satisfy insurance companies and to protect against possible theft, they keep their furs and employees in sight, but in safety.

Dealers in Heads and Tails

On the side streets, nearest the fringe, are usually the open-door hole-in-the-wall places, numerous and often poorly lighted one-room shops. Some deal in tails only. Others sell heads. Some of them are strictly "paw" men whose business is counting, matching, and sorting Persian lamb paws for coats and trimmings.

One tail man told me he often counted as many as 75,000 tails in a month. A paw man very soberly said he must have counted at least four times that many, since his animals all had four feet and only one tail.

Some places deal in old furs only. Here men rip, sort, and match. Often they search through hundreds of bedraggled and worn fur coats for that microscopic "good spot" that could be used for patching.

Ten Million Muskrats for Coats

The hopefuls who are of the district, but not quite in the main current, cling like determined barnacles, dealing in neither hide nor hair but in such trade items as linings, muff beds, shoulder pads, and button forms.

A. Hollander and Son, Inc., has its business office tucked away in the fur district, but its big processing plant spreads over more than a block in Newark, New Jersey.

More than 10,000,000 muskrats alone are handled at this plant in a year's work—enough to make at least 150,000 full-length coats. The pelts are "dressed" (i.e., tanned), then returned to the manufacturer for assembly into "plates"—stitched-together fur pieces which make up the backs, fronts, sleeves, and collars of coats. The plates then come back to Hollander.

Almost a thousand local people work here

Staff Photographer J. Baylor Roberts

Raw Fleece and Finished "Beaver" Are Sisters Above the Skin

Master Industries, Inc., at St. Paul, will turn these hides into mouton beaver by the Calva process, a chemical formula for rearranging the structure of fibers (page 399). Plastic beaver is waterproof, mothproof, and almost wearproof, and it costs only a fraction of the real thing.

Fish and Wildlife Service

Each Year the Aleuts on St. Paul Island, Pribilofs, Salt Down 60,000 Sealskins

At roundup time excess males are driven on to the tundra, stunned, killed, and skinned. Carcasses and blubber are made into meal and oil on the island. Pelts are shipped to St. Louis, where the Fouke Fur Company, agent of the United States Government, processes and auctions them. An Alaska sealskin is so light and pliable that an entire pelt passes through a napkin ring. These Aleuts live on the Pribilofs. The Government feeds, clothes, doctors, and schools them (pages 391, 394).

in small groups. Some sort, stamp, and number the plates as they arrive, so that all the pieces of one garment can be easily identified.

Some brush in chemicals to condition the fur for dyes. Others operate the huge sawdust-filled drums and cages into which the furs are repeatedly introduced after each process for special cleaning, greasing, drying, or dampening.

A muskrat pelt which aspires to be a finished coat does much traveling. After the sorting, numbering, and chemical conditioning, the pelts are ready for the "ground blending," a process by which the muskrat receives its all-over basic coloring.

Then they are again returned to the manufacturer, who flips them over, fur side down, dampens the leather, and begins shaping and stretching them into a space determined by an outline traced on a board.

Once the "fit" has been achieved, he nails the skins to the board for drying. Before they are returned to the Hollander plant, they are "squared," or cut exactly for size.

With preliminaries completed, they are sent back to Hollander where the muskrat gets its "stripes" of distinction, those dark, finely made lines which make it "akin" to the costly mink.

The first stripe is made with the aid of a tapered ruler and a narrow brush dipped in dye. But each successive stripe—and there are many made over this original one—is strictly an "eye" job, done with a turkey feather and spray gun (page 393).

The feathers come from New England turkey farms and must be from the left wing for right-handed workers and from the right wing for left-handed workers, because of the direction in which the feather bends.

Staff Photographer John E. Fletcher

"Ladies," Says the Salesman, "Please Observe the Beautiful New Look"

This wild-mink coat, modeled in Saks Fifth Avenue, New York, falls within 13 inches of the floor. It is priced at $7,200, including tax. Prominent is the new dropped, rounded shoulder line. Skins on the back are worked in a sunburst effect, narrow at the shoulders and flared out at the hemline. Customers select style and matched pelts; their coats are made to measure.

Striping is done with dyes, but the term "dyed" is seldom applied to the muskrat. Because the dye is introduced from the tip of the hair to the pelt from the top side rather than by immersing the entire pelt in a dye bath, the term "blended" is preferred. Thus a processed muskrat becomes a mink-*blended* muskrat, a sable-*blended* muskrat, or some other fashionable *blend*.

In the basement men wearing knee-high rubber boots tossed muskrat plates into huge tanklike vats equipped with water-wheel paddles. I climbed the ladder and looked into one of the tanks. Hundreds of pelts were sloshing around and around for one of their many cleanings.

In another room small iron kettles bubbled away on tiny iron stoves.

A handful of dye boiled in these kettles was enough to dye all the furs that could be crowded into a single vat.

In still another room were stored these valuable dyes—the carefully guarded secret of the fur trade. Bottles, sealed cans, and glass jars stood on their shelves in nameless but numbered neatness.

We visited the drum room where furs receive their sawdust baths. The huge wooden cylinder-shaped drums were revolving with their loads. Some were filled with the type of sawdust which cleans, others with the types for greasing, dampening, or drying.

Each time a chemical or dye touches the coat pieces they are tossed into a drum. Each time they leave the drum they are "caged" in metal mesh-enclosed cylinders which spin at a furious pace to force the clinging sawdust from the fur.

Plates Handled a Hundred Times

I asked how many times each plate was handled before it was considered finished.

Staff Photographer Robert F. Sisson

Nailers Tack Down Furry "Ropes" for Shaping into a Masterpiece in Mink

Here some 65 skins, "let out" thrice their original length, lie face down on a paper pattern. Moistened, they have been stretched to uniform length. Nailed fast, they will dry for a day. Collar, if any, and sleeves will be added at the finishing. Hanging patterns look like white shirts on a line.

"Well, I should say at least a hundred," Mr. Paul Hollander answered. "You see, each time a coat gets a stripe, for instance, it has to be drummed. It may go into the drum with hundreds of other coat pieces. But before it can get its next stripe, it has to be sorted again according to its serial number so that the original striper gets the same coat back for all the striping" (page 393).

In one room hung hundreds of coats. I stepped in just long enough to read the thermometer. The temperature stood at a sizzling 110°. This was the drying room, thermostatically controlled, where coats spend a short period.

Standing at waist-high tables, glazers brushed in the secret formula which would make the muskrat a rich and lustrous fur. They brushed the fur flat with the solution, then in reverse with a glazing stick.

Elsewhere I found the versatile muskrat being kicked, plucked, sheared, and dyed to resemble Alaska seal. This time the term "dyed" is used rather than "blended," because the entire pelt gets a thorough dowsing.

Here one machine, equipped with power-driven paddles, or "feet," trampled and kicked the pelts into pliability by working oil into the leather. Indians achieved the same result centuries ago by walking barefoot on the skins.

Another machine plucked out the guard hairs. One sheared only the sides of the small pelt, while still another sheared the back. But their efforts, plus the dye job, all added up to the finished product—a good imitation of a genuine Alaska seal parading under the trade banner: Hollander seal-dyed muskrat.

The pelts I had seen here—and there were others in addition to the muskrat—were a mere handful compared with the hundred or so different kinds of animals which contribute to this expansive industry.

Acme

Starting a Coat, a Cutter Slices Minkskins into 6,000 to 7,000 Furry Ribbons

This is a preliminary step in the costly "letting out" process, which achieves beauty of line. Later the strips, fully severed, will be sewn in a different position, so that the skin becomes long and narrow, rather than wide and short. Casual examination shows no trace of these changes (page 379).

Some of these went through as many processes as did the muskrat. Others, expensive ones such as mink, sable, and chinchilla, were painstakingly worked by hand.

Wearing Qualities of Furs

I found numerous conflicting opinions about the durability of the muskrat as well as of various other furs. One furrier said that durability didn't depend on the fur bearer but on the fur wearer. Another said it wasn't a question of *what fur,* but *what for.*

Still others agreed that two skins of any two animals might look identical but wear differently. This, they explained, was because one animal was pelted when it was "prime"—fully furred. The other was taken too early and was "unprime."

Different parts of the same pelt have different wearing qualities. The backs of most animals wear better than the sides. The sides generally outwear either the bellies or the paws, but the fur trade uses them all.

I finally managed to extract from a maze of pros and cons—after taking many factors into consideration—the fact that otter is generally considered the most durable of furs. Mink, beaver, Alaska seal, raccoon, and Persian lamb also rate high on this chart.

Harem Life of the Fur Seals

In the Pribilofs, a small group of islands off the coast of Alaska, thousands of fur seals congregate each year. The males arrive in advance of the females, usually in May, to fight for the choicest rookeries.

When the females begin approaching the islands in June, the bulls start their battle all over again. Each male, with much bellowing and blowing, seeks to gain and hold as large a harem as possible. Those who are either too young or too weak to fight for family rights become "bachelors," segregate themselves from the main herd, and live in

solitary bliss on another island (page 394).

From these exclusive bachelor quarters three-year-old "idle bulls" are selected for pelting. The catch for 1947 was 61,447 pelts, having a raw pelt value of between $2,500,000 and $3,000,000.

Curiously, the pups, born on the rocky fog-bound islands within a few days after the females' arrival, have little natural inclination for the water life they are to lead. They receive their encouragement by sound "spankings" administered by the parents.

Conservation, killing, and shipping are under direct supervision of the Department of the Interior's Fish and Wildlife Service.

The skins are salted (page 388) and shipped to St. Louis where the Fouke Fur Company, under Government contract, dresses, dyes, and auctions the pelts. Processing each skin takes approximately three months; operations number well over a hundred.

Before the arts of dressing and dyeing were perfected, many of the pelts were shipped to England to be used for trunk linings.

English trunk makers lined trunks in the winter and laid bricks in summer. These versatile gentlemen of two trades boasted of their ability to outdrink any other tradesmen. One day, ignoring a rush order, they gathered round the forbidden pot of ale to prove their prowess.

An argument arose. A scuffle resulted. A barrel of water, and probably much ale, was accidentally sloshed over the pile of skins lying on the floor. Frantically the workmen attempted to dry the pelts. The fur was exposed to the intense heat of an open fire.

The skins dried, but some of the hairs fell out. One bright lad discovered they were only the stiff top, or guard hairs, and that the fur left had the softness of velvet. He suggested they pull out all the top hair and line the trunks with plucked pelts.

The proprietor was none the wiser until his customer ordered more trunks. This time there was no accident and the workmen filled the order with unplucked pelts. The customer refused the shipment. Only after much questioning did the puzzled proprietor extract the true story of those linings from his crew.

After this accidental discovery, sealskins were used for coats and trimmings, but they were still heavy and bulky and far removed in beauty from the velvety sealskin coats of today.

Evolution of Fur

The first covering used by man was the skin of an animal. The cave dweller who stalked his prey through vast forests and over wide plains became the world's first manufacturer and dresser of hides when he crudely cured his catch and wore the pelts.

The Bible relates, "Unto Adam also and to his wife did the Lord God make coats of skins, and clothed them."

Down through the ages furs have often been the prize of battle, the badge of royalty, and even money.

Their use has been restricted by laws which dictated what could be worn and by whom.

These laws made ermine and sable the sole property of kings and queens. They granted furs of lesser beauty to the nobility. The type allowed bishops was denied to other individuals still farther down the social scale. Some were forbidden the use of any fur in their meager wardrobes.

In the United States the evolution of fur from a luxury to a necessity of general use came with steam heat. As radiators began to sizzle, people became too warm indoors. Ladies began to shed their under woolens. Clothing was restyled. Indoor clothing became lighter in weight, while outdoor clothing became heavier and warmer.

Then the furriers, sensing fortunes to be made, stepped in. They began tossing out coats on a scale and in a price range which almost every woman could afford and few could resist.

The demand soon exceeded the supply. Nature could no longer fill the traps fast enough, and fur farming on a scientific basis began.

World's Largest Fur Farms

Although mink had been raised experimentally as early as 1866 in the United States, the fox sped ahead to take the honors.

On Canada's Prince Edward Island in 1894 Charles Dalton and Robert Oulton began experimenting with red and silver foxes in an effort to produce a true breeding strain.

The first publication of their sales figures in 1910 established the success of their venture. They received an average of $1,339 for 25 pelts.

The idea soon filtered through to American fur men. By 1913 the boom was on and breeding stock had skyrocketed to as high as $35,000 for a pair of proved breeders—almost 50 times the price of a single pelt. But this bubble popped. Pelt values toppled. Men who had sunk fortunes into silver foxes dropped out.

A few farseeing ranchers began buying foxes at rock bottom prices and, with normal profits in mind, began fox farming on a sounder basis.

Staff Photographer Robert F. Sisson

A Striper with Spray Gun Dyes Muskrat to Look Like Mink

The first of these dark lines is applied by yardstick and narrow brush; others are done "freehand" by eye, turkey feather, and gun. As each stripe is marked in, the coat is fluffed with sawdust in a revolving drum at the Hollander plant in Newark, New Jersey. For each additional stripe it is returned to this man, as another worker might alter his style (pages 388, 390).

There now are approximately 7,000 fur ranches in the United States. Wisconsin alone has more than 800. They range from the small one-pen backyard type to two of the largest fur farms in the world, Fromm Bros., Inc., and the Nieman and Co. ranches (pages 396-7).

A few animal experiment stations have been set up for research in feeding and general management under direction of the Department of Agriculture, and also in the College of Agriculture, University of Wisconsin.

Trappers who contribute millions of wild pelts to the market every year have been taken under the wing of the Government, too. The Fish and Wildlife Service of the Department of the Interior acts as "parent" for the man with the trap as well as supervisor for the seal catch in Alaska.

Fromm Bros. have their fox and mink pens scattered over more than 20,000 Wisconsin acres. This includes farms at Thiensville, north of Milwaukee, furring grounds at Hamburg, manufacturing plants at Merrill and New York City, and the huge laboratory at Grafton where animals may have their ailments treated.

A close runner-up, operating just a few miles from the Fromm farms at Thiensville, is one of the Nieman establishments. Nieman's combined ranches often exceed Fromm's in the number of fox pelts sent to market. As many as 40,000 prime foxskins have been taken in a year.

At one of the seven Nieman farms I found Ronald G. Stephenson, an energetic individual whose business is fur, but whose side interests range from fishing and photography to zipping around the country in his own plane. He runs his own commuter's service between his Cedarburg ranch and his furring range at Hermansville, Michigan.

My first introduction to Mr. Stephenson was rather abrupt. We shook hands. I was ushered into the farm's utility room. The Venetian blinds were pulled down. I was seated among the bottles and benches and various serums. A movie screen was tossed up at one end of the room. And the story of fur farming began to unfold in color.

The complete life of fox from pup to pelt was shown. Carefree days in pens from spring until early fall. The shipping of thousands of animals by truckloads to their winter

© Fouke Fur Company

From the Rocky Pribilofs the Roar of 3,500,000 Alaska Fur Seals May Be Heard Miles Away in Bering Sea

Each June the cows settle down on two islands to drop their pups. In harems ranging up to 100 cows they are bossed by breeding bulls five times their size. For three months these bulls do not eat or drink but live off their blubber. Meeting all challengers, they wind up the season emaciated and exhausted. Government regulations allow only surplus three-year-old bachelor bulls, living on the fringe of the colony, to be taken for their furs. (pages 388, 391)

furring grounds in the north. The few brief weeks of freedom when these ranch-raised foxes were allowed to roam over thousands of wooded acres just as their wild brothers before them had done.

The horse-drawn carts lumbering over miles of snow-covered roads to deliver fresh meat to the animals. The depositing of little mounds of red meat beside the road. The shadowy forms of foxes stealthily moving through the woods toward the food (page 385).

Mr. Stephenson explained that the animal, subjected to the extreme cold and freedom of the range, grows a thicker coat of fur. Under these conditions the prime pelt is glossier, the fur heavier, the skin more valuable.

Fox Heads for Last Roundup

Unknowingly, the fox heads for his last roundup in late November or December. Men trained for this tricky work close in on the animals from every part of the range, driving them toward wired enclosures.

The fox, by now, has tasted and approved of his freedom. He shows resentment and runs wild. The chase is on.

Once caught, the animal meets his death quickly and painlessly. A few whiffs of gas or chloroform are sometimes used, but most ranchers prefer electrocution.

The next reel showed the skinning room. With incredible speed the pelt was slipped from the carcass. The operation is quick, but not simple. About 20 separate steps and as many persons are involved in "peeling" the pelt.

Many workers were women. One was an expert at removing the tail bone. Another slit the tails. Some loosened the skin on the heads. Others concentrated on the area around the eyes. The job of loosening the skin around the toes, legs, and haunches fell to still others.

Each step was a move toward that quick final zip of the loosened skin when the pelt leaves the carcass as one fully furred skin.

Next we climbed to the top of one of the farm's lookout towers. From these vantage points a rancher can tell whether all is well with the little foxes.

Directly below us was a complete fox family—the father stalking along his well-worn paths through the tall grass, his offspring tumbling along at his heels, and the vixen, sitting calmly on her haunches.

I could see in every pen foxes following their trails—never taking shortcuts, never beating new tracks, but, like their untamed ancestors, following the well-worn, self-made, "safe" course.

The fox family suffered from no housing problems. They all had duplex establishments. Mr. Stephenson pointed out that one was for living in and the other was for hiding.

"Another hangover from the wild state," he explained.

To fool and elude her enemies, the wild vixen frequently moves her family from one den to another. Ranchers soon found that they must supply the domestic fox with means to satisfy this instinct.

From the tower we worked our way through deserted mink pens toward the southeast corner of the ranch. Stephenson began putting on heavy gloves. I was puzzled and decided this was all part of the show until he entered the pen of a golden-throated, weasel-like animal which screamed insults at him and called upon her offspring to do likewise.

These were the hard-to-raise marten—American relative of the Russian sable. Only a few of these, I learned, had been successfully ranch-raised.

Stephenson finally shut the mother in her "second" house and took one of the protesting young. It looked like a miniature bear cub with a cuddly disposition. Its brother screamed and snarled at us from his safe perch inside the pen.

"They're funny little animals," Stephenson said. "They mate in the summer, but don't produce until the following March or April—if at all!"

It was the "if at all" that stumped me.

"It seems that the female just carries the fertilized egg around in a sort of undecided or dormant state until about December. At this critical period, a change in diet, weather, even a change in keepers, can affect the development or production of young," he explained.

The Temperamental Mink

Not all Wisconsin ranches are limited to fox raising. Some have mink and foxes. Some specialize in mink alone.

Fromm's ranches at Thiensville and Hamburg accommodate some 25,000 mink as well as the huge fox family.

The fur of this restless, and often vicious, cousin of the weasel fades, "rusts," and generally dulls in bright sunlight. So Fromm has his mink population tucked away in a dense grove of trees.

The grove was well leafed over when I visited the ranch.

The mink is a temperamental animal as well as an extremely valuable fur bearer. Its food requirements are very much the same as those of the fox—horsemeat plus mink mix.

An Airplane Passenger Above Wisconsin Would Never Guess What Grows on This Farm

Some 50,000 foxes and 50,000 minks live behind wire on the 15,000-acre checkerboard. Here Fromm Bros., Inc., and Nieman and Company maintain offices, cold-storage rooms, and a food-preparation plant near Thiensville.

Vernon J. Kraft Studios

In Duplex Huts, Each with Private Lawn, Foxes and Vixens Raise Silver Furs for Man

Fenced-in protection does not destroy the foxes' instinct. Like their wild brothers, they want twin dens with dual escape hatches, one for living in and the other as a maternity ward (lower right) (page 393).

But if the frisky little mink gets a prolonged diet of raw fish he develops a strange disease—Chastek paralysis.

Mr. J. S. Chastek, a fur farmer of Minnesota, discovered this malady among his mink when he fed them raw fish for three weeks straight. Now fish, when fed, is either cooked or limited to Friday's menu or, at most, stepped up to two or three times a week.

I made a hurried trip north to Green Bay to visit Harley Wittig's ranch. Mr. Wittig devotes his time to raising fancy mutations—those Silverblus and Royal Kohinoors which bring fabulous prices (page 400).

Some of the kit mutations, squirming in their nests, still had their eyes tightly closed to the world.

As we went from nest to nest picking up these tiny mouselike creatures, he explained that the mink kit when born seldom weighs more than a fifth of an ounce and is about the size of a cigarette. Within six months they are fully grown and prime.

Visiting a Chinchilla Ranch

There are hundreds of chinchilla ranches in the United States, ranging from the happy "twosome" raised in a parrot cage to the thousands scientifically housed and fed on farms.

I visited Dr. M. R. Howard's Genesee Mountain Fox & Mink Farms, Inc., in the snow-capped mountains west of Denver. In three cinder-block houses several hundred adult chinchillas and their offspring had taken up housekeeping.

These tiny, rodentlike animals which contribute their small pearly-blue, gray-black, softer-than-down pelts to some of the most expensive fur garments made, originally had their home in the high reaches of the South American Andes (pages 400, 401).

Before the fleet little animals were almost completely wiped out of existence by persistent hunting of the Indian trappers and their dogs, an American mining engineer, M. F. Chapman, caught a few.

Chapman searched the Andes of Peru, Bolivia, and Chile for five years before he obtained the four females and seven males he brought back to California in 1923.

The descent from their mountain homes to sea level took almost three years. The trip down was made a few hundred feet at a time, with stopovers to allow the animals time to become adjusted to the difference in altitude.

On the 40-day jaunt from Chile to Los Angeles there were many weather shocks. While crossing the Equator the animals were kept on ice. Four days from their destination in the Northern Hemisphere where winter was in full swing—at which time, had the chinchilla been at home in the Southern Hemisphere he would have gone into a summer seasonal "molt"—Mr. Chapman's entire "catch" shed their fur.

Shivering, and almost nude, the animals made their spectacular entrance into California wrapped in woolen blankets and surrounded by hot-water bottles.

Ancestors of the alert animals I saw scampering around in their spotless cages on Dr. Howard's farm, as well as the stock of hundreds of other chinchilla ranches in the United States, were those eleven hardy fur bearers brought from the Andes to California.

These were the only animals so far encountered on my fur journey which were without offensive odor.

The chinchilla, I learned from their enthusiastic caretaker, makes an excellent pet (if you can afford one), is extremely fastidious, intelligent, and curious.

"Watch!" the caretaker said. "Want a raisin, Susy?"

Apparently Susy did. She practically turned somersaults of delight. When a sunflower seed or a peanut was substituted, she sniffed the edible bit and none too politely cast it out of her life.

A Model Chinchilla Home

Chinchillas are vegetarians, eat very little, and are inexpensive to raise. Their once-a-day rations consist of vegetables, fruit, grain, a little hay, and an occasional raisin for dessert.

"Even with high prices," I was told, "it seldom costs more than $4 a year to feed a chinchilla. Sometimes only $2."

There was a fountain at one side of Susy's cage which she could turn on and off by merely bumping her nose against the tiny tap. A "tub" filled with pure white sand stood invitingly in one corner.

Here Susy and her spouse took their baths by shuffling around in much the same fashion as a sparrow taking a dust bath. They also roll over like a horse. And fastened to the outside of the cage was an electrically warmed "nursery" where Susy's offspring snoozed.

At birth the baby chinchilla weighs only about an ounce and a quarter and is scarcely two inches long. The parent seldom measures more than ten inches in length. It takes more than a hundred of these carefully matched pelts to make a coat. A chinchilla coat may cost $35,000, even more.

There are fewer than 25,000 chinchillas in the United States at present. The earlier

Staff Photographer J. Baylor Roberts

An Escaping Prisoner Is Run Down by His Cousin, the Guard at a Wisconsin Fox Farm

This intelligent mongrel thinks nothing of bullying the aristocratic platinum fox. Not unlike a cow pony at the end of a taut lariat, he takes a grip on the tail and keeps his quarry off balance, lest it turn and bite him. Ranch hands complete the capture, seizing the fox by its tail and the scruff of its neck. Other dogs sniff out minks, but do not attempt to hold them.

enthusiast who, like Dr. Howard, ventured into chinchilla ranching, paid as much as $3,200 for a single pair. Breeding stock now sells for less than half that price.

The business isn't yet on a pelting basis. Most of the skins being auctioned today are "casualty" pelts taken from animals which have died or have been accidentally killed.

From a desk drawer Dr. Howard took one of these small pelts. I was told to close my eyes and touch the fur. It was like dipping my hand into a cloud. There seemed nothing to touch.

The extreme softness of the fur, Dr. Howard explained, is due to the fact that as many as 80 hairs sprout from a single hair follicle.

The Miracle of Plasticizing Furs

Amazing recent development in the fur field is the plasticizing of furs, especially sheepskins.

To me this process seemed like making something valuable out of something that didn't even exist. But to Dr. José B. Calva, a Mexican-born chemical engineer living in Minneapolis, it is just a matter of chemistry.

In Dr. Calva's model plant I saw huge bundles of ragged-looking sheep pelts awaiting a miracle treatment. As he fingered the matted woolly pelts, he explained:

"It's just a matter of changing the disposition of the molecules in these fibers. Each fiber has a series of loops or kinks which have to be straightened out permanently before the pelt has any marketable value as fur.

"Now, each fiber is composed of a family group of molecules—self-satisfied, self-sufficient—interested only in its own group and opposed to intruders. The next step is to shake this dull indifferent group into a state of so-called curiosity by supplying a chemical which arouses a desire in the molecule group to admit or join outsiders."

© Genesee Mountain Fox & Mink Farms, Inc.

Grand Champion of Mountain States Fox and Mink Show Was This Platinum Mink

A grayish-blue coat gives this mutation the coined name Silverblu, which originated in Wisconsin (page 398).

© Genesee Mountain Fox & Mink Farms, Inc.

They're High-class Rodents—a Chinchilla Wrap Would Cost Thousands of Dollars

Persistent hunting in the Andes, ancestral home of these downy animals, almost wiped out the species. After five years' work an American collected eleven chinchillas. With hot-water bottles and ice packs he nursed them to sea level, across the Equator, and into the Northern Hemisphere. United States chinchillas descend from those pioneers. This family, raised on grains and greens, dwells in comfort in the high Rockies.

With quick pencil sketches Dr. Calva further simplified the process by drawing a double-lined arc. The inside of the arc, he explained, was naturally shorter than the outside. Therefore, the molecules which made up the inside of the curve were either smaller, fewer, or more closely packed together.

To make this inside part of the arc equal to the outside—in other words, to make a straight line out of a curved one—it was necessary to open the molecule chain and either enlarge the existing molecules or add to the chain a sufficient number to equal those already existing in the outside line of the arc.

This is what Dr. Calva does to the fibers of the sheepskin. He takes the kinks out of the wool.

The finished product, resembling the finest of beaver pelts, belongs to the world of fur-coat buyers. The cost of "mouton" is only a fraction that of genuine beaver. It is waterproof, mothproof, and practically wearproof (page 387).

Greer-Hale Chinchilla Ranch

Baby Chinchilla Converts Milk into Gorgeous Fur

A quiet extinction for fashion's sake is not the fate in store for this two-week-old native of New Market, Virginia. As chinchilla breeders' demands are still unsatisfied, only the skins resulting from natural deaths are marketed. Fur farms hope to get about $75 a pelt when they start sales a few years hence, but there is no assurance yet of such a price.

I asked Dr. Calva how long he thought a processed coat should last. He replied, "No one has lived that long!"

I saw a sheared and plasticized sheepskin when I was in the fur district in New York City. It served as a doormat in a busy office building. Thousands of people had trampled over it in the five years it had been used. Mr. Benjamin H. Weiss, president of the Calva Fur Patents Corporation, put the pelt through a blower to remove the surface dirt and to fluff up the fur. It looked almost new again. I could detect no visible sign of wear.

In Dr. Calva's Minneapolis office, laboratory, experimental station, and reception room, occupying almost one entire floor of a mid-town office building, I was given a box of small pieces of fur—beaver and simulated beaver—and asked if I could pick out the real beaver.

I was certain I could. I thought I knew beaver well by this time. After pawing through the contents of the box I selected an especially fine square of plasticized sheep!

Rat into "Sable"

Dr. Calva's work is not limited to sheep or lambskins. He has turned the Chinese rice rat into a fine "sable." He has processed the Australian wallaby and made it "muskrat." Unshorn long-haired sheep, under his hand,

Pennsylvania Game Commission

Eager Beaver in Fur Pants Balances on Shovel Tail and Takes Nourishment

Master engineer as well as fur bearer is the beaver. Damming small streams, he stores life-giving water, controls floods, checks soil erosion, and creates fish and waterfowl havens. However, he'd as soon chop a farmer's apple tree as an aspen. Once all but extinct, the beaver is coming back. This kit, about one month old, was live-trapped. He'll be used in a beaver-resettlement program (page 380).

have assumed the beauty of lustrous, deep-furred fox. Even thin, rubbed, or otherwise valueless pelts discarded by trappers and ranchers have taken on new life, gloss, and fullness when Calva-processed.

In 1947 mouton was increasingly popular in the low-priced field. A large number of all the new fur coats made last year were moutons, but not all of them were Calva-processed.

Plastic furs lend themselves well to color, too. They have blossomed like gay flowers in all the colors of the rainbow. Bright reds, royal blues, canary yellows, purples, and burgundy are only a few shades in the mouton fashion parade.

Pelts for plastic furs come from Australia, South America, and from the millions of sheep and lambs slaughtered each year in the United States. New use for the lowly sheep pelt has placed this wool producer on a fur pedestal. In the fur trade it is pushing far ahead of the prolific rabbit. In time it may even displace the muskrat, long considered the barometer of the trade.

But whether your choice is mouton from the chemist's vat, fancy mutations from the fur farmer's pens, or the lustrous rich sable trapped in Siberia, fur is big business in the United States.

I traveled across many States, looked into hundreds of pens, talked with scores of ranchers, dealers, auctioneers, and manufacturers, but still there were hundreds of experts I hadn't seen.

Many of these I would never see, since fur is limited to no single region. Nor is it limited to a single country. It is a matter of world-wide geography, its tapped and untapped sources spreading over the entire globe.

INDEX FOR JULY–DECEMBER, 1947, VOLUME READY

Index for Volume XCII (July–December, 1947) of the National Geographic Magazine will be mailed upon request to members who bind their copies as works of reference.

An Arnhem Land Adventure

By Donald F. Thomson

With Illustrations from Photographs by the Author

SINCE its discovery in 1623, Arnhem Land, an untamed no-man's land in northern Australia, has remained unknown to the world and virtually unexplored. It is the home of the only Australian aborigines who have persistently dared to defend their way of life. Armed only with long wooden spears, these primitive nomads have battled white men and their rule.

In 1933 there was more than the usual amount of trouble. In Caledon Bay the aborigines raided bêche-de-mer boats and killed Japanese sailors. On Isle Woodah, in Blue Mud Bay, they massacred three white men that same year. Taking iron from ships' tanks, the raiders retipped their Stone Age flint spears (pages 416, 420, 429).

Though there was talk of a punitive expedition, the Australian Government decided first to send an investigator to inquire into the aborigines' grievances. I was selected for that expedition.

My commission amounted to an order to go native, make friends with the nomads, and bring about peace. For two and a half years I was the white man's envoy to the blackfellows. I persuaded these untutored people, I trust, that it was wrong to kill uninvited visitors.

"Open Season" on Japanese

Oddly enough, I had to reverse my teachings several years later. During World War II the Army sent me back to Arnhem Land with a band of Solomon Islands warriors. This time it was my duty to inform the blackfellow there was an open season on Japanese.

I recall the excitement attending arrangements for the first expedition. A newspaperman, confronting the anthropologist about to go into the bush, put the question, "Well, Dr. Thomson, what are you going to wear?"

"Wear?" I said, and then I realized that what he wanted to ask was, "How much are you going to leave off?"

And so, early one April, the beginning of the dry season, the time of the southeast winds, I sailed out of Cairns in north Queensland in the auxiliary ketch *St. Nicholas* on the 1,000-mile run to Caledon Bay.* The local citizens turned out in force and gave me a very kindly send-off. But a little austere. After all, they thought it was a funerary rite.

I got a real thrill at the sight of my name entered in the ship's manifest as "master." I had collected a scratch crew of local natives. We avoided the major complications about instruments by dispensing with them and carried only a lead line and a compass.

I had planned to revisit my old haunts on the coast of Cape York Peninsula en route to Thursday Island. At Lockhart River I found Tommy, the guide, philosopher, and friend of all my previous expeditions to Cape York Peninsula, waiting for me.

"More Better Me Die Home"

He was eager to accompany me, and we sailed northward to Thursday Island, where I had intended to "sign on" my crew of Queensland natives to serve with me in Arnhem Land. But after a few days they came under that spell that had been following us along the coast—the feeling that we were bound for that bourne whence no man returns.

And so at last Tommy, in capacity of spokesman, sidled up to me.

After two or three preliminary coughs, always a prelude with him to a momentous announcement, he said tentatively, in a sepulchral voice in tune with the gravity of his mission:

"Boss!"

"Yes, Tommy?"

"Boss, more better me die home!" (It is better that I should die at home in my own native land.) The white man's magic was at work again.

I had known that Tommy had something on his mind. His preoccupation had been evident for days, but I had attributed it to his too-active imagination. His thoughts had obviously not been on his job. But this was a state of affairs that, from long experience, I knew was not altogether new with Tommy.

While I was busy with arrangements for departure, I had set the boys to scraping and painting a launch. The paint was a priming coat of red lead and raw oil to preserve the wood. A few hours later I returned to find the trim little vessel a sickly, sticky pink, which gave her a curiously naked appearance.

And there was about that paint a strange lumpiness. Hours elapsed and still it showed no signs of drying. Its stickiness claimed my

* See the National Geographic Society's new Map of Australia, a supplement to this issue.

In Arnhem Land "King" Wongo Is a Man of Distinction

Wongo trims his beard, plucking out each hair, in a style adopted long ago from Celebes voyagers (pages 406 and 409). The author won Wongo's gratitude by doctoring his people for yaws. Wherever he went, tribesmen thrust children at him, pleading "Jacksin!" (injection).

attention, and I smelled it. The boys had mixed the red lead with half a gallon of crude castor oil!

A few weeks later I started down the Roper River toward the Gulf of Carpentaria in a native dugout canoe on my way to Isle Woodah and Caledon Bay. I carried a "message stick" (page 410) that had been given me in Darwin by three Caledon Bay prisoners then serving long sentences in Fanny Bay gaol for killing Japanese.

This stick was to be delivered, with a verbal message, to their father, old Wongo, 500 miles away at Caledon Bay (page 406).

When we pushed out into midstream, I was sharing the canoe with two men, who plied the bow and stern paddles; an old woman, a young woman and her child; my own dog Tiger and two native dogs; our swags, or bedding rolls; and a quantity of stores. When the canoe was fully loaded, we had a freeboard of just four inches.

These wooden dugout canoes are of Malay origin. They are perfectly smooth below the water and without keel or outrigger. Much skill is required to trim them; yet the natives make voyages many miles out to sea in these craft.

When they capsize, the crew rolls the craft over, retrieves household gods, clambers in, and then proceeds to bail the water out until the canoe is floating high again.

A sudden movement, a difference of opinion among the dogs, a too-enthusiastic lunge by one of the crew, ever on the lookout for game, at a water "goanna," one of the monitor lizards *(Varanus)*, on an overhanging branch of a mangrove, threatened at any moment to precipitate disaster. We cut sticks and boughs and laid them crosswise inside the canoe to keep the gear off the floor, and took turns bailing to keep the water from rising to the level of the cargo.

At frequent intervals we pulled into the bank, unloaded the cargo, and calked the cracks native fashion with wads of soft tea-tree *(Melaleuca)* bark, or paperbark. Then we loaded up again, mustered the dogs, and pushed off.

The Australian aborigine is a delightful traveling companion. Whatever befalls, he accepts it with the best grace. Nothing puts him out, and he does not fume and swear at delays. For him there is always tomorrow, or, in the phrase of my Arnhem Land friends,

"Yullulla" (by-and-by).

These people have a curiously logical habit of replying to questions that at first gives rise to many misunderstandings. When the canoes appeared to be making water, I would shout, "He no leak?"

"Yes!" would come the reply. Feverishly we would make for the bank and beach the canoe, only to find that the craft was not leaking at all. After many false alarms you see the logic of his reply; he has answered your question literally. "Is it not leaking?"—"Yes." (*I. e.*, "Yes, it is not leaking.")

Crocodiles on Roper River

The Roper River is wide and deep and is tidal for a very long distance from the mouth. Crocodiles were numerous, frequently basking on its mud banks or gliding to the edge of the water like great lizards. Here they were so numerous and so bold that, whenever I went to the water's edge to drink, a native would throw a branch or a log into the water in front of me to frighten away possible crocodiles.

From Her Tiara Dangle Six Crocodile Teeth

Though she is but 12 years old, this girl is a bride, for early marriage is normal in Arnhem Land. Like a white woman, she is her husband's partner, not his slave. As her lot is not unduly hard, her disposition is good.

In the months ahead I never dwelled long on this precaution nor gained much satisfaction from contemplating it, for we had to swim many rivers and raft our gear across. The first question when we prepared to swim a river would be, "Baru-mirri?" (Crocodiles with? *I. e.*, "Are there crocodiles?") "Willirr!" came the reply cheerfully. (*Willirr*—little white shells on the shore; hence, "like the shells on the seashore.")

Some distance from the estuary I picked up the *St. Nicholas* again. We transferred the cargo, not without a sigh of relief on my part, to the vessel and sailed down the river. Near the mouth I met a large group of natives who were engaged in hunting dugong, which they harpoon from dugout canoes in the shallow waters of the Gulf.

We spent a day with these people, enlisted two or three of them to act as guides, and on the following morning sailed for Isle Woodah.

A southeast gale was blowing right into the estuary as we beat out across the shallow bar. For several hours we drove into a heavy sea in the teeth of the gale.

When we cleared the bar and the sandbanks off the mouth of the river and swung northward, we had the sea on our beam, and at length I ran for shelter behind Edward Island, off the mouth of the Phelp River. The waters

With a Dog, His Sole Companion, the Author Meets "King" Wongo and His Ghostly Hunters

Caledon Bay huntsmen smear bodies with gray mud, hoping to deceive the red kangaroo's eyes and nose. They admired Tiger, Dr. Thomson's kangaroo dog, a

Draining the Goose Swamps, the Uncharted Glyde River Meanders Across a Dismal Landscape and Empties into Arafura Sea

Sluggish at high tide, the Glyde becomes a torrent at low water. One night the author anchored his ketch between the gray mud banks. Ebbing tide, thick with fallen trees and debris, almost swept the boat away (page 425). Smokes on the right show that grasslands are being burned by men hunting small game.

A Dormitory Six Feet above a Log Fire Roasts Sleepers but Discourages Mosquitoes

This platform, sustained by stakes, is occupied only in the wet season. In the swamps, egg hunters build beds in tree forks. They use sticks for mattresses and bark for covers (page 428).

here are uncharted, and the island was surrounded by shoals, with dirty, yellow, discolored water breaking as we felt our way in with the sounding line.

All through the night the wind continued to blow with the force of a gale, and the vessel rolled heavily, shipping water across the decks. We spent a cold, miserable night. On the following day the wind seemed only to have increased, and it looked as if we should be weather-bound for some days.

Planning to make a quick journey overland, I took with me only two natives and barely enough food for four days. Eight days later, without food, barefooted, our clothes torn to ribbons, our blankets either torn up to make bandages to protect our bleeding and lacerated feet or abandoned because we were too weak to carry them farther, we reached Bennet Bay, the southern part of Blue Mud Bay, and the *St. Nicholas* just in time.

Hermit Crabs and Sea Gulls for Food

We were in a bad way. The existing maps gave little idea of the country and were merely deceptive, and we did not meet a single native. Day after day we had fought our way through dense undergrowth, our way barred by wide estuaries, and had been obliged to make long detours or to swim.

Sometimes we had to wait hours for the tide to fall so that we could cross at low

water; sometimes we walked for 18 hours at a stretch, traveling far into the night and leaving again before dawn on the following day. Hermit crabs and a sea gull or two helped to keep us alive.

At length, when our strength was far gone, we found a nest of turtles' eggs. Later I was glad to eat shipworms (*Teredo*), snakes, and lizards.

From Bennet Bay we sailed northward toward Woodah, a little island in Blue Mud Bay. It has no permanent resident population, but is visited at regular intervals by the various groups of the Blue Mud Bay peoples on their seasonal wanderings.

It has long been a place of ill repute. As early as 1803 the English navigator Matthew Flinders reported that the natives of Blue Mud Bay had speared one Whitewood, master's mate of the *Investigator*. Flinders named Morgan Isle, close to Woodah, after a Marine who died of sunstroke there.

It is the home of a number of small groups, each with a slightly different dialect. By their neighbors the people of Blue Mud Bay are generally referred to as Dai'i. To the northward the Caledon Bay natives are known popularly as the "Balamumu tribe." This is not really the name of a tribe, but is applied loosely by natives to the westward to a number of distinct groups of which the Caledon Bay peoples form a unit.

Old Wongo, of Caledon Bay

Wongo and his sons—for these people are patrilineal and trace descent, and membership of most groups, through the father—belong to a clan known as Arrawiya, made famous through the prowess at arms of one man and his strong sons.

At the time of my first visit, Wongo and his group were at Trial Bay, just to the south of Caledon. We approached this camp overland on foot, and the journey was a memorable experience. Only then did I realize how great is old Wongo's influence and how much he was feared by his neighbors.

Some miles to the south of the bay we picked up the tracks of some natives which members of my party recognized at once as those of some of Wongo's group, including the tracks of a woman named Clara (page 410). To the south of Trial Bay is a belt of dry but dense tropical jungle intersected by native pads, or paths, that wind in and out of its dark thickets.

While we were negotiating this jungle, the natives with me were expecting an ambush at each moment. They could not be induced to speak aloud, but would communicate with one another only by sign language or in whispers. Fortunately the camp proved to be on the other side of the bay.

That night was an anxious one, and I was the only one of the party who slept well. The natives squatted by the fire on watch, and on this journey they began a practice that they employ only in hostile country when they expect to be attacked by avenging expeditions.

At intervals one of the party would stand up and cry out in a loud voice, addressing one of Wongo's group by name:

"Wuluwirrir, you are walking about, come out, do not hide yourself. A big man *(bungauwa)* is here, traveling about, looking for you to make good you people, to make quiet this country. We all come without spears, without spear throwers [not strictly true]. We come for a good thing."

The object of this was to stay the hand of the enemy who might be prowling about, ready to fall on our camp. For it is the practice of these people, who carry out organized raids, to send an advance guard to spy out the land—to locate the camp.

These *milngo,* or scouts, return for the main body, who, after painting themselves with white paint, grotesque and hideous in the dark, surround and fall upon the sleeping camp.

"I Bin Jump Beef"

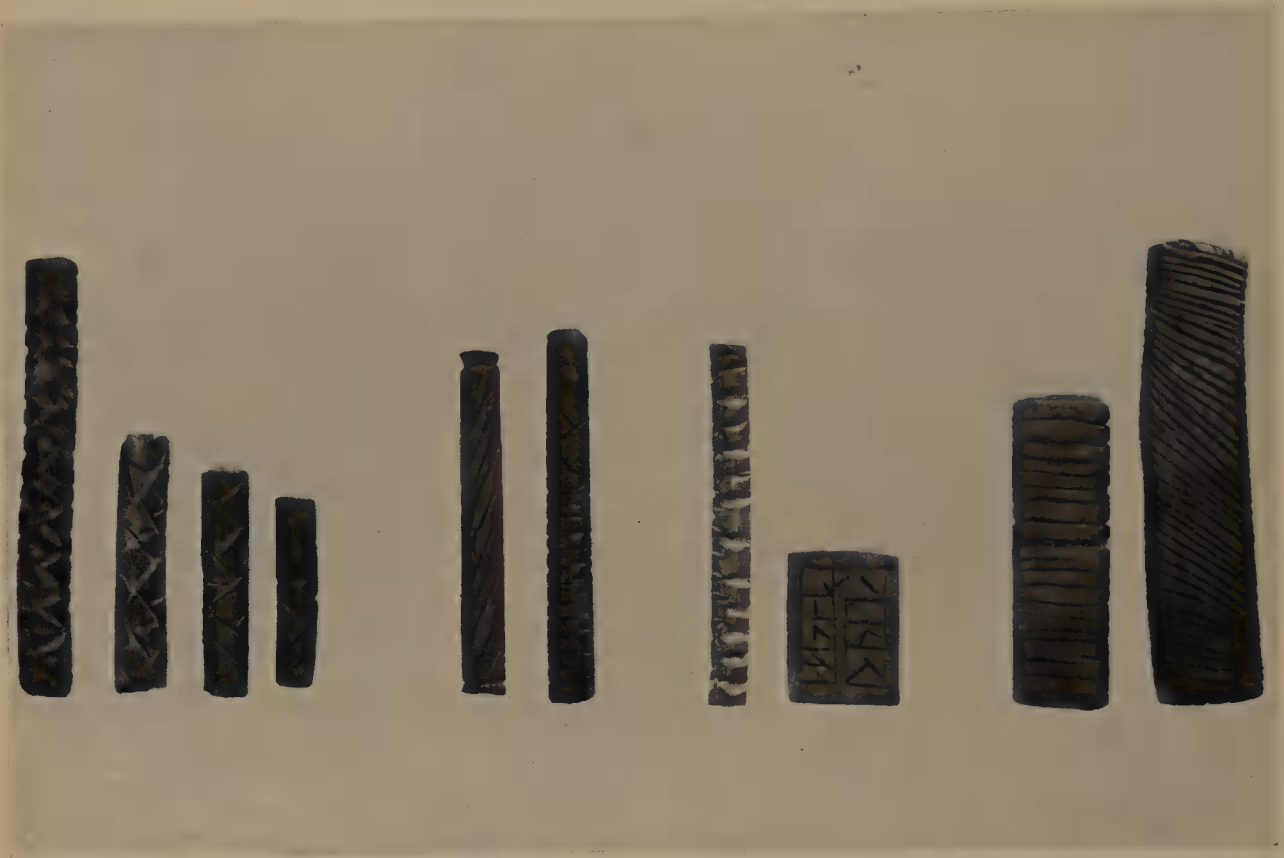
A number of omens are believed to portend the approach of strangers or visitors.

Therefore, when Raiwalla (page 415) came up to me in a state of excitement and declared solemnly, "I bin jump beef," I knew that he was not inferring that he had been emulating the renowned Welshman "Taffy," but merely that he was expecting a visitor. He was informing me in correct idiom that he had had a muscular twitching, indicating, according to the part of the body in which it occurs, the relationship of the stranger.

The next day was a memorable one—the day of the meeting with Wongo, grand old man of Caledon Bay, the most renowned warrior in the history of the Australian aborigines (pages 404, 406).

I can say fairly that I approached this man without any sentimental bias, with an open mind, and that I left him, after spending about two weeks with his group, with respect and admiration.

I am not going to paint him with a halo. He has been a great fighter, and he has won for himself among black man and white a renown that I do not think has been equaled by any other Australian aboriginal. When I saw him, he was about 55 or 60 years of age, not a big man but well built and strong. He



A Message Stick Like These Was Honored as the Author's Passport to Arnhem Land

Popular belief credits the aborigines with ability to write messages. Actually, their carved sticks carry no words, but identify a messenger and remind him of his verbal message. Handicraft, however, is recognizable.

had a strong face, with some cunning and not without guile; a man of no mean intelligence.

I knew that, as we met, he was a little afraid of me. Two of his sons were already in Fanny Bay gaol, and I do not think that he expected ever to see them again.

There had been more trouble at Caledon Bay, and he knew that the Government was not pleased with his people. I was probably the first white man whom he had met who represented himself as being a Government man and who had come to him with an assumption of authority.

We got on very well together at this meeting. I rarely saw him after that except with a mischievous twinkle in his eye. A few days later, when he was sick, he sent for me, and I knew that we would be friends.

Probably the most remarkable feature of this old man's face was his eyes, which were direct and penetrating. His face was clean-shaven except for a long beard, confined to the tip of his chin, which gave him some distinction.

This type of beard is much affected by the old men of Arnhem Land. They rub the black wax of the "sugar bag," or wild bee, into their faces and then pluck out the hairs singly—a laborious and rather painful proceeding.

Wongo is the most remarkable aboriginal and the strongest character that I have met among these people. Popularly, he is spoken of as "King" Wongo, "Chief" of the Balamumu tribe, but it must be remembered that anything approaching kingship or chieftainship is quite foreign to Australia. Nevertheless, Wongo has a tremendous influence, not only on this coast but for a considerable distance over neighboring territories, chiefly by reason of his remarkable personality.

Wongo is a marrying man, and the number of his wives is legion. The genealogy that I have collected shows no fewer than 22, most of whom still survive, with numerous children.

I delivered to the old man a message stick, together with the verbal message, from his sons in Fanny Bay gaol. That night there was a great cry in camp, a ceremonial crying for the dead, or the ritual lament for those long absent.

Clara, a Native Woman

In the old man's camp I met still another remarkable native, a woman this time, whose name is only less renowned than that of Wongo himself. She is known even at Caledon Bay by her white name of "Clara."

In the many misleading rumors that have

A 20-foot "Magnetic Anthill" Is Neither a Compass Nor the Home of Ants

Termites, working by night, erect the mud spires, a dominant feature of northern Australia. Their thin sides face north and south so that, according to one theory, the broad walls may dry more quickly in the east-west sun. These nomads cut lumps of termite mud for use as stones in their overnight fireplaces.

A Lonely Shore of the Crocodile Islands Appears Unfruitful; Yet It Abounds in Food and Useful Fibers

When the tide is out, natives comb the reef for shellfish. In places they trap fish in stone weirs fringed with woven rushes. By night they catch sea turtles laying eggs in the sand. The seeming palms are screw pines, or pandanus trees. Their nuts yield a rich oil; leaves go into baskets and canoe sails.

Members of the Men's Club Squat Around a Make-believe Water Hole and Chant about Mythical Ancestors' Herculean Deeds

Women, who share the clan's hunting rights, are taboo at its sacred "sings." Such corroborees re-enact in pantomime the exploits of heroes who supposedly chartered the clan's way of life. By settling down with the aborigines, the author learned their language, customs, and beliefs.

Packaged for a Cannibal Ritual—Human Flesh

On his forehead a Glyde River man bears a parcel of dried blood; on his back he carries flesh. Both were taken from a victim overcome by a medicine man's magic. Eaten ceremonially, they are supposed to make hunters fearless and lucky. Cannibalism to satisfy the appetite is taboo in Arnhem Land.

come from this coast she has frequently been reported to be a half-caste, and to her has been wrongly attributed much of the trouble that has occurred. It was said that she was a woman of great cunning and wide influence, an Amazon who laid the plots and directed their carrying out.

In reality, I found her to be just a harmless old woman. She was a widow who, after a hard and eventful life, was struggling bravely to bring up her two children in a difficult country.

Clara is a woman of the Mara tribe of the Roper River district. She was taken with her husband on a trepang lugger to the Caledon Bay area many years ago. Trouble brewed, and the boat was attacked. The crew got aboard and escaped, but Clara and a child were taken, and she was made the wife of her captor. This must have happened about 20 years before my visit.

She had lost her own language, for she could not understand a word of Mara when one of my boys from the Roper spoke to her; but she remembered him and his personal history. She knew some English, too. But this was not remarkable, for she would have had the opportunity of speaking from time to time to bêche-de-mer fishermen.

Clara is regarded, quite wrongly, as a half-caste. It is probable that the presence of this woman, who spoke some English and who had been taken captive by Caledon Bay natives, gave rise to a legend. Still firmly believed in certain quarters, it concerns the existence in this country of white women survivors of the ill-fated steamer *Douglas Mawson* (lost in the Gulf of Carpentaria in 1923), who are said to be held prisoner by the natives.

The country between the Gulf of Carpentaria and Arnhem Bay is among the roughest in Arnhem Land. During 1936 it fell to my lot to carry out another long and severe patrol among the rocky hills and ravines of this region in pursuit of a native known as "Slippery" and his horde. They were a little band of semi-outlaws inhabiting that area, following an outbreak of fighting and the killing of several natives.

"By-and-By Snake Bite Me"

The first night on this patrol was a remarkable initiation into the supernatural beliefs of these people. I had been carrying out work

on social organization just before setting out on this journey, and during the collection of data on a kinship system one of the natives was confronted with the name of his sister.

The brother-sister taboo is strongly developed among these people. A man may not even pronounce the name of a sister. If the name of his sister should be spoken before him, it is *mirriri.*

And if he should hear an indelicate or obscene reference to a woman who stands in the relation of sister, as may occur in an altercation between women or a domestic difference, it is again *mirriri* and frequently leads to a fight, unless ritual expiation is made. It was generally the custom, when the name of a sister cropped up in these kinship discussions, for the people to get a bystander to speak the name for them, which was done in a whisper or undertone.

Raiwalla, the Author's Faithful Guide in the Bush

In World War II, Raiwalla followed Dr. Thomson into the Australian Army and became a corporal. Now he is back in Arnhem Land, his birthplace, where he is renowned as a fighter in single combat. His scars, worn as a sign of maturity, were produced by cutting flesh and rubbing mud into the wounds.

This time my informant looked about him in vain, and at length, as nobody was present, he reluctantly pronounced the name. As he stood in relation to me of classificatory brother, the woman whose name was spoken was sister to both of us. It was a ritual offense that required an act of expiation or ritual purification to avert a supernatural visitation.

"By-and-by snake bite you and me!" he exclaimed uneasily.

I forgot the incident.

A day or two later we set out on a long patrol in quest of the fugitive Slippery and his group. It was the first day out; we camped, after a hard stage, at dusk, close to the southeast corner of Melville Bay. The natives had made their camp and were squatting about their little fires in the bush.

I had unrolled my own swag and was lying stretched out luxuriously on the canvas sheet. It was about dark. Suddenly I had a sensation of something very cold and clammy on my bare legs.

Looking down, I could just discern a snake, attenuated as he moved and showing around the upper part of his body a series of light rings which stood out clearly in the gloom.

Mentally reviewing the nocturnal snakes I knew with such vividly defined bands, I thought at once of the brown tree snake *(Boiga fusca).*

I had not seen one so far north in Arnhem Land, but the previous year I had secured a single fine specimen on the Roper River. It

To Indulge a Taste for Eggs, a Canoeman Runs the Goose Swamps' Gantlet of Horrors

Grass edges cut like knife blades. Every movement precipitates a shower of ants and spiders. Mosquitoes bayonet the arms; leeches torpedo the legs. The author accompanied this hunter on an unforgettable adventure (page 424). Two goose eggs rest on the large grass nest.

Aboriginal Spearmaker in His Munitions Factory Chips Flint as the Red Men Did

This artisan uses a flaking technique now known to only a few old men. Ngillipidgi quarry, lying in a range back of Blue Mud Bay, contains an inexhaustible supply of raw materials (page 429).

He Spins His Wife's Hair to Make a Belt for a Men-only Ceremonial

Other woven strands of human hair whirl bull-roarers, the narrow wooden slats used for making roaring noises at aboriginal religious rites. A dilly bag, catchall for personal possessions, hangs like a purse from the spinner's neck.

was only slightly venomous—one of the so-called "back-fanged" snakes—not likely to bite unless aroused and by no means dangerous, and I wanted more like it.

I determined to capture this specimen for my collection. It was very cold, and I could just see it in the dim light.

In a leisurely way it negotiated my left leg, glided onto the canvas, and began unhurriedly to cross the other leg. The slightest movement might alarm it and lose me a coveted specimen.

A Deadly Snake

I lay quite still, calling to one of the boys to bring a fish spear with which I could pin it down without injury and capture it alive. No use to ask a native to capture it, for they are very much afraid of snakes. Meanwhile, it had crossed my legs, and just as it was making for cover we pinned it down.

When the natives brought torches to enable me to secure him, their light revealed a thick, sinister-looking, broad-headed snake, splendidly marked with transverse bands. But it was not a brown tree snake. Instead, it was a death adder *(Acanthophis antarcticus)*, one of the deadliest snakes found in Australia!

Raiwalla, my guide (page 415), looked meaningly at me, paused to spit with an emphasis that had a curious, telling quality, then remarked drily: "I bin talk first time! By'm-by snake come!"

A supernatural visitation!

Raiwalla was not in the least surprised; he had foretold just this and he was vindicated. As for me, I had no answer; a really satisfactory response must sound spontaneous! It was, indeed, a remarkable coincidence.

I collected and catalogued more than 300 snakes in Arnhem Land, but this was the *only death adder I met in more than two years!* We took him back alive, more than 200 miles in my water tin (page 423).

To tell of the animal life of Arnhem Land,

Wilderness Baby Is Mamma's Spoiled Darling

When born he was pinkish brown, and mother smeared his body with charcoal to turn him a stylish black. He will not be weaned until his sixth year. Until initiation he will be indulged in every way—never scolded or punished.

and of its geographical difficulties, is no easy matter in a small space, for the abiding impressions are often of little things, incidents, a glimpse of something that suggests mystery.

And then, again, the wonder of all these things is largely in the eye of the beholder; they are, as book reviewers say, "not everybody's meat." But I recollect vividly a memorable afternoon on the middle Glyde River in central Arnhem Land.

Archerfish and Mudskippers

The Glyde is a strongly tidal stream and at low water is reduced to a trickle running at the bottom of two steeply sloping walls of deep gray mud—a river, in fact, whose only claim to even passing notice is its really striking resemblance to the great gray-green, greasy Limpopo of Africa.

The boys were all ashore and away, and I was alone on the boat. No very promising prospect greeted me from the deck. At first I saw only gray, discolored water, gray and muddy banks, and, high above, a fringe of gray-green mangroves. Nothing more.

But in a moment a fish, its body laterally flattened and marked by a series of black cross bars, projected a curious undershot, disdainful snout. He was quite an ordinary fish, one that you might, in a manner of speaking, pass in the street without comment, except that his nose betrayed him. I recognized *Toxotes*, the archerfish or riflefish. This is a sporting creature that, by the simple expedient of a jet of water cunningly aimed, brings down flies and small insects unwary enough to settle too close to the water.

Nor was this all. When I shifted my gaze a little higher, the bank was transformed and was teeming with life. For a moment I had the impression of an aerial view of a busy city, albeit one of bizarre inhabitants.

Hordes of fiddler crabs, each male with one great overdeveloped, asymmetrical claw upraised as if in threat or in defense of his blue armored body, emerged from unpromising-looking holes in the ground. Each raised aloft a pair of eyes on long stalks and began to bow and scrape.

It was a kind of Mad Hatter's tea party, so that momentarily I had the impression that I was back in civilization.

Dotted here and there over the great mud flat were those curious and wonderful little jumping mangrove fish, or "mudskippers." Because of their freakish breathing mechanism,

Crocodile Islanders Traverse Deep Coastal Waters in a Frail Bark Canoe

The author rode a leaking bark canoe into mosquito-infested swamps where wild geese hid their eggs (page 416). A single sheet of eucalyptus bark sheathes the hull; seams are lashed with cane.

Father Emu, Who Mothers the Family Brood, Takes Striped Chicks Exploring

Australia's flightless emus, next to their cousins the ostriches, are the world's largest birds. On long legs they race across the plains; a pursuing motorist clocked one at 32 miles an hour. Arnhem Land hunters, lying in tree-branch ambush, spear emus feeding on fallen fruit.

A Hunter-warrior Lives by His Spear

He has several types of spears. Some are for game. Most of those used for birds and fish are multi-pronged. Another, capped with sting-ray spines, is for ceremonies. This hunting lance is iron-tipped. A throwing stick (in the right hand) increases the arm's leverage, speeding the cast.

they are able to leave the water for long periods. They leap about on dry land by employing their pectoral fins and tail fin much as a seal does its flippers.

Hunting the Water Buffalo

But these are small fry. If you are impressed by size, I could tell of a buffalo hunt or two that would have been epics even in the days of Paleolithic man.

There are a few water buffalo in eastern Arnhem Land, introduced in the early days of white settlement in the Northern Territory. Their strongholds are still far to the westward, in the Alligator Rivers region and thence eastward as far as the King; but a few, generally lone old bulls filled with wanderlust, range as far east as Cape Arnhem. Perhaps they are outcasts from a herd, immense in size and morose through isolation, for too much introspection is an ill thing even for a buffalo.

The natives still hunt these formidable beasts on foot with spears, preferably with stone-headed spears traded from the far-famed quarry at Ngillipidgi (pages 416 and 429).

Since they cannot hope to kill with a single spear thrust, they must make the quarry bleed and then follow him until he falls from loss of blood and exhaustion. A jagged stone spearhead, which becomes detached from its setting of "sugarbag," or beeswax, when it penetrates, is ideal for the purpose, for it causes a dreadful wound.

If the natives catch the buffalo in mangroves or heavy timber, he is easily approached, for the tree provides a safe refuge for the hunter. In the open, however, among flats of blady-grass or low scrub, a wounded bull buffalo is a formidable enemy.

At Buckingham Bay not long ago a lone hunter followed a buffalo and succeeded in wounding it. But the animal turned the tables on the hunter, whose pulverized body and tracks told the tale of his death, which must have been slow and prolonged.

Still more recently, at Cape Arnhem, a great bull was followed and wounded. After a heroic encounter the wounded beast took to the water, swam some miles out to sea, and found refuge on a rocky islet.

For the most part, the interior of Arnhem Land is unmapped and largely unexplored. On the coast are great salt pans and low coastal plains, sometimes bare, sometimes sparsely covered with *Salicornia,* the rank grass that thrives in brackish, marshy conditions.

This country is interlaced by a maze of salt-water estuaries and salt arms, which are infested with crocodiles. Inland the country

The Nomad Has No Matches; Yet He Kindles Fire in 40 Seconds

Each hunter carries a bundle of firesticks and fiber tinder. As one stick rotates in a slot cut in another, friction starts a flame. On chilly nights the aborigines sometimes carry smoldering torches to light their pipes and keep themselves warm.

rises to low wooded hills, barren, often outcropping with stone and with an abiding loneliness. But travel here has its rewards.

First Crossing of Arnhem Land on Foot

I remember vividly that crossing of east Arnhem Land on foot in 1935. The maps told nothing. For days we had walked across the bed of a dry swamp, its soft green sward and peat muffling our footfalls, to emerge at last on the foothills of a range. From the top we gazed across a wide valley to a vista of blue hills, which was to be repeated day by day.

One knew that if one traversed the valley and climbed the hills in the blue distance there was the same again, and tomorrow, and tomorrow, and tomorrow. And nothing, nothing at all to suggest that ever human eye had looked on it before. Certainly no white foot had ever trodden there.

Days sometimes were spent in crossing a few hills having rocks so sharp that one's boots were cut to tatters on a single patrol; and then this ordeal would be succeeded by a day (and a night) when 40 miles would be left far behind and one felt that he could never tire.

The world was still young; difficulties were made to be laughed at; one could carry the world on one's back. While under the spell one is unconquerable.

The most difficult travel was near the coast, for here I encountered many rivers that were not named, not even suggested on the maps.

Time after time we found our way barred by salt-water estuaries. At first I thought of detours, for there is always something sinister

Sacred Snake Is Etched on Shield with Human Blood

Only initiated men may look upon the clan emblem, under penalty of death. Its proud custodians crown themselves with emu plumes and paint chests with white pipe clay. Bird down forms the shield's white background.

about these dark-green or muddy depths into which a crocodile has slipped imperceptibly from his sunning on the mud bank, like a boy in school intent on avoiding the stern eye of authority.

The Discretion of the Crocodile

But this is merely the reptile's discretion—I could write a treatise upon the discretion of the crocodile. If you think he has gone, you are mistaken! Generally he reappears in midstream. All that shows above the surface is the tip of his insidious snout, with its valvular nostrils, and his evil golden eye.

We soon perfected a technique for crossing these rivers. To raft our gear across, the boys collected dry "float wood" and the bark of a *Hibiscus*, lashed the logs together to form a flattened raft, and covered it with paperbark. Pushing this ahead of us, we swam together in a body, making as much noise as possible. There were crocodiles present, and even when we did not see them the banks were scarred by their sharp claws and grooved by their great slides. Scarcely one of these rivers or creeks but has its more or less recent story of a crocodile victim.

But for us there was no danger! The natives said so. You would not die by crocodile unless it was preordained: unless a medicine man had worked his evil magic and willed it so, so that you were under his spell.

But I—sometimes I remembered that though there might be twenty of us, my skin alone was white!

I see still a crossing place by the Minnie, a river to the south of Blue Mud Bay. We had been waiting for the tide to fall in order to reduce the distance we had to swim. We were three—one boy and I, and Tiger, most faithful of dogs. When the proper time came, we went down to the spot to make ready.

The crocodile is a wily reptile. With a timeless patience that has something of the inevitability of eternity, he makes it his business to watch fording places that provide him with victims. Sure enough, there was one in midstream, right in our path.

He was floating high in the water, brazenly; even the hard scutes of his tail were clearly defined. But he had come too soon.

We made a detour upstream, waited for nightfall, and crossed in the dark.

It was bitterly cold; I remember the struggle through the tangle of mangrove roots on

White Clay Embroiders Lacy Patterns on Newly Initiated Clan Members

Symbols are painted by old men in a pagan ceremonial roughly corresponding to Christian baptism. They represent designs "invented" by the clan's mythical ancestors. Their meaning is secret.

This Ugly Death Adder Stole into the Author's Bed. "We Took Him Back Alive"

In camp one evening Dr. Thomson felt "something clammy." Mistaking its venomous nature, he allowed the snake to crawl across his bare legs; then he made a leisurely capture (pages 415, 417). The death adder's spiny tail bears the undeserved reputation of stinging. Fangs carry its deadly poison.

Primordial Women Pluck Fruit from a Living Fossil

This cycad, whose ancestors grew in the Coal Age, is not the palm it seems to be. The nuts are toxic, but soaking and cooking remove poison from the flour. Baked, the bread lasts for weeks, giving the natives a food reserve. A straw cape (right), woven from pandanus leaves, serves as sleeping mat, tent, raincoat, and mosquito net.

the far side in the pitch-darkness. We moved to the edge of the salt pan and lay down for a few hours. Daylight saw us pushing off again northward.

Tales of Tree Dwellers

The object of this journey was twofold. Primarily it was to demonstrate beyond question that the area was really under control; that I had succeeded in my undertaking, and that, in spite of all that had happened, a white man could live and travel in the interior without danger from the natives. But it was also to enable me to see the interior of Arnhem Land, to make contact with the natives, and to make a study of the native food resources.

We set out on this journey in October, hottest and driest time of the year, which precedes the breaking of the northwest monsoon, the wet or rainy season.

On the first two days we traveled through dry, arid, inhospitable country. On the third day we crossed the Glyde River, here a little trickle that passes through a wide gap between hills, and entered a low-lying area. It was a vast swamp bed like a fine park, covered with fresh green grass and studded with clumps of splendid paperbark trees.

The natives told me that during the "wet" this area was converted into a great lake or swamp which formed the nesting place of the magpie goose, also called semipalmated goose *(Anseranas semipalmata)*. They made long journeys, they said, into the swamp in quest of the eggs of the wild geese (page 416).

These journeys occupied many days and were carried out in bark canoes of a curious type. Since there was no dry land, they built platforms in the trees, on which they lived and cooked their food.

These reports fired me with determination to return again before I left the territory and find out all about it, for nothing of this kind had ever been recorded hitherto from Australia. Far away to the east, south, and west, rugged hills and rocky outcrops rose abruptly and showed blue in relief against what we could see of the horizon.

The patrol journey promised to be of interest geographically and to shed some light on the tangled river systems as represented on the only maps available.

Toward the end of the rains in 1936-37 the natives began to bring in reports that gladdened my heart. The floodwaters were rising, the "water grass" was high; the geese were mating and beginning to trample down the long grass to form their great nests.

Navigating the Glyde River

I took the *St. Nicholas* as far up the Glyde River as I thought safe, but encountered difficult and dangerous conditions (page 407).

At high water the river had been a wide, slow-running stream; but a few hours later the tide had fallen rapidly, and we found ourselves between two walls of sticky, villainous-looking gray mud. We were so far down that we could see nothing of the surrounding country above the banks, and we were still descending, in a river bed now reduced to a narrow stream of water that had suddenly become a raging torrent.

The water was of a dark, muddy color, thick with logs, trees, and other objects which were being swept toward the sea. The river was running with dangerous swiftness, and the stream was far too narrow to enable me to turn a boat more than 40 feet in length and drawing six feet of water.

I put out as much anchor chain as I dared, got out a second anchor, and put out bow and stern lines to the banks. But by this time the current was running so swiftly that the vessel was in danger. I had to let go the stern lines, lest she get broadside to the current, and concentrate on keeping her in the center of the narrow ravine that now formed the river until the tide turned.

Mosquitoes came in millions and I spent one of the most wretched nights of my existence. On the following morning I swung the boat on the full tide and took her downstream to a safe anchorage.

My efforts were rewarded. Not only was the whole country through which we had walked on the overland journey the previous year now converted into a great swamp, but the natives in reality did journey in bark canoes into the swamp in quest of goose eggs.

I accompanied these expeditions twice and obtained photographic and cinematograph records of these remarkable peoples.

Since there was no dry land on which to camp, and the canoes, only 10 feet in length, were too small for sleeping, the natives were obliged to camp in the trees. In the upper

Modesty Wears a Plywood Fig Leaf

Visited centuries ago by Indonesian sailors, natives of Groote Eylandt learned to screen their women behind portable walls of bark. This precaution set a permanent style. Unmarried men are forbidden to enter the women's quarters.

To Trap Fish and Harvest Swamp Roots, Nomads Settle Down Beside a Stagnant Billabong on Blue Mud Bay

Rushes produce edible corms and water lilies tender rootstocks. Fish are speared, netted, and caught in weirs. Blue Mud Bay, whose hinterland appears here, was named in 1803 by the navigator Matthew Flinders, who wrote: "The bottom here is a blue mud." It is like quicksand; waders sink to their thighs.

Swampland's Haystack Igloo, a Screened-in Mosquito-raid Shelter, Makes Life Possible for Egg Hunters

When night brings hungry, humming swarms, the women crawl into their thatched paperbark hut, plug the door, and light smoky fires. Usually their men are deep in the swamps, hunting geese. Dozens of goose eggs, ready for roasting in coals, hang above the narrow entrance as if in a Christmas stocking (page 424).

Water-lily Seeds, Ground to Paste, Molded in Loaves, and Baked, Make Lily Bread

The author, who ate native foods for two years in Arnhem Land, found the bread palatable, though it is heavy, coarse, and unleavened. Lily seed capsules rest on the cook's right.

branches they constructed crude platforms where they slept and cooked their food.

Only the men took part in the excursions into the swamps; women and children remained in camps on the high and dry land on the margin of the Arafura swamp. Only frail bark canoes, each made from a single sheet of the bark of the stringybark tree (*Eucalyptus tetradonta*), were employed on these long quests by the goose hunters (page 416).

Accidents often occurred. On the last journey I made, 21 canoes set out. One was destroyed on the journey, the stern of another was torn off and had to be resewn, and a snag was driven through the bottom of the canoe in which I squatted in a pool of water.

Each canoe carries, as a rule, only one man. He propels it with a pole, after the manner of a punt, with extreme skill and dexterity. Driving the canoe through narrow openings among the trees which stand in the water or through dense thickets of grass is hard work and calls for expert handling and long practice. My canoe was only of normal size, and with two men aboard instead of one it was so deep in the water as to have very little freeboard. At frequent intervals water slopped over the edge, and I sat all day in a puddle.

My canoeman spoke a language that I could not understand. Since he knew no English, conversation was confined to two or three words in a language of the coast.

"Bulna, bulna! Ngarra yauyun!" he would exclaim with monotonous regularity. "Wait, wait! I shall bail." Or, when the discomfort of the steadily rising water grew acute, I would exclaim in turn, "Yauyuro, yauyuro!" (Bail, bail!)

Because of the incredible number of mosquitoes, which make life almost insupportable for a human being, the natives construct a special type of house (page 427). It is beehive-shaped, like those of many other parts of Arnhem Land. In addition to the usual covering of paperbark it is heavily thatched with grass, in which only one or two doorways are left, so small that entry to the hut can be gained only by crawling.

At sundown the natives retreat into the *wurlies*, plug the entrance holes with grass, and light smoke fires within, making a hole in the roof just sufficient to permit the smoke to escape.

One night my kangaroo dog, Tiger (page 406), lay on the open deck of the *St. Nicholas* on the Glyde River. In the morning he was covered with gorged *Anopheles* mosquitoes so distended with blood that it exuded in drops

Stone Age Man Inspects His Armory of Chipped-flint Spearheads

Ngillipidgi flints, chipped with pounding stones and packaged in bark parcels (left), are traded for hundreds of miles. The author is the first white man ever to visit the quarry (page 416).

from the ends of their bodies, and the deck had the appearance of having been sprayed with blood through a fine spray. From that time Tiger had to live inside the wurlies at night or he could not have survived.

Tree Platforms

The long journeys with the goose hunters and the camps in the upper branches of the trees were the most remarkable experiences of the two years I spent in Arnhem Land.

The platforms were frail and somewhat crude affairs, made by wedging three or four poles in forks suitably situated and laying sticks across them to form a floor. The floor was then covered with sheets of tea-tree bark.

No nails, lashings, or fastenings were used, and one had to be careful to avoid upsetting the platform by walking close to the edge.

When firewood was required, the natives climbed out as far along a branch as seemed expedient and broke off dead sticks. If their demands were more ambitious or when the supply was exhausted, they crawled backward over the edge of the platform, descended the tree trunk to the canoe moored below, poled across to a neighboring tree, climbed for the required wood, and repeated the performance on the return journey.

But it was an unforgettable experience to sit in early morning or at night looking across the parklike expanse of the swamp to see, from one's sleeping platform, the sun rise or set over the water; to watch the long file of canoes at dusk converging on the prearranged camping place, bringing in their spoils; to see at night on all sides the glimmer of campfires high up in the trees or reflected below in the dark waters of the swamp; and to listen to the talk of the natives as they lived over again the day's adventures, recalling critical moments in the stalking of the quarry killed or lost, while they plucked and cooked the geese.

These are the unforgettable things, not least because no white man had ever seen them before. These are the things that remain, the things that I see as I write. Already almost forgotten are the long, endless nights of torment when the mosquitoes made life almost a burden. Forgotten, too, are the days when every forward plunge of the canoe through the grass brought down a shower of ants and spiders; the gorged leeches; the trickles of blood down one's legs; and the pools of blood on the bottoms of the canoes.

Toward the end of the goose-egg season the water was beginning to dry up in the swamps

and the vegetation was breaking down and growing very dense. This made our progress increasingly difficult, but eventually we reached the boat, worn out with hard travel, lack of sleep, and the ordeal by leech and mosquito. Our skins were cut with the sharp cutting grass and had become rough, dry, and scaly through constant immersion in water.

To add to the difficulties, my equipment was beginning to show the strain. The cameras were constantly developing faults. Sometimes shutters jammed, and I had to sit down and effect temporary repairs.

I was relieved to find the boat safe, but the boys that I had left in charge reported that a big airplane with "*mintji* like damper" (marks like a damper) had flown up the river and swooped low over the boat.

The mintji were the colored "cockades" of a Service aircraft, an amphibian from the RAAF, which was to meet me in the Crocodile Islands (page 412) for a reconnaissance of the region over which I had been walking for nearly two years. The plane had arrived at the rendezvous before me, and we were still nearly a day's journey up the river.

But it was low water, and we could do nothing until the tide turned. We snatched a hurried supper of goose eggs and lay down for a short rest.

During the night, as soon as the tide turned and the moon rose sufficiently high to show the river as a shining pathway between two dense black walls of mangroves, we swung the vessel and ran downstream, dead slow, fighting the longing for sleep and keeping a sharp lookout for the great logs floating everywhere. At daylight we crossed the bar and ran out into the open sea.

I can live it over again as I write; even now, after many months of "civilization," I cannot believe that it is merely a memory.

These are the real things, and I fancy I hear still the loud "He-e-e-e," like an organ note, with which the goose hunters hail one another down the long lanes of the swamp, or the husky trumpeting of the geese over my sleeping tree. That was real; it was then that I was alive.

It was bitterly hard work, and I was often lonely, sometimes discouraged. But why do I yearn to be a blackfellow again?

Arnhem Land Expedition of 1948

HOW do Arnhem Land aborigines subsist? How do they compare with other primitive peoples? What birds, beasts, and fishes share Arnhem Land with them, and how do these creatures influence the native way of life?

Answers to such questions are sought by American and Australian scientists who compose the Arnhem Land Expedition of 1948, sponsored jointly by the National Geographic Society and the Smithsonian Institution in cooperation with the Commonwealth of Australia. They will spend the 1948 dry season, March to October, in this Maine-size aboriginal reserve in the northeastern corner of Australia's Northern Territory.

Leader of the expedition is Charles P. Mountford, ethnologist of the South Australia Museum at Adelaide. Mr. Mountford, student of his continent's aboriginal art, customs, and culture, described "Earth's Most Primitive People" in the NATIONAL GEOGRAPHIC MAGAZINE for January, 1946. His American associates in Arnhem Land are four Smithsonian Institution scientists.

Photographs and measurements of the natives, and mechanical recordings of their various dialects, will be made by Frank M. Setzler, anthropologist. He will also make facial masks for use in the U. S. National Museum exhibits.

Native fauna, extinct elsewhere in Australia, will be sought by Dr. David H. Johnson, mammalogist. Many Arnhem Land mammals are marsupials, from tiny mouselike animals up to giant kangaroos. There are bats and rodents in strange variety, the dingo or wild dog, and the dugong.

Bird specimens from northern Australia will be collected by Herbert G. Deignan, ornithologist. Species and even genera new to the Museum series are a possibility.

Arnhem Land's archerfish and mud-skipping goby (described on page 418) are listed for study by Dr. Robert R. Miller, ichthyologist. Among other strange fishes Dr. Miller expects to meet are the stinging catfish, the rock-skipping blenny, and a fish found inside sea anemones.

Nowhere in Arnhem Land are charted trails passable for trucks or automobiles. The expedition's approach to the reserve is by small schooner to coastal stations on Van Diemen Gulf, the Arafura Sea, and the Gulf of Carpentaria. Natives serve as porters for journeys inland.

Of five bases selected for the expedition's use, one especially suited for study of marine life is on Groote Eylandt (Big Island), just off Arnhem Land's east coast in the Gulf of Carpentaria.

Other bases are at the heads of navigation of mainland streams, where Christian missions were established early in the century. These are lonely exceptions to the ban on the white man in Australia's aboriginal reserves.

Accompanying the expedition will be Howell Walker, Staff Photographer of the NATIONAL GEOGRAPHIC MAGAZINE, who already has spent several years in Australia.—THE EDITOR.

The Society Maps a New Australia

WITH ship and plane loads of 20th-century pioneers pouring into sparsely settled Australia, the National Geographic Society this month brings to its 1,700,000 members a 10-color supplement map of the island continent.*

This full-length portrait shows a continent in transformation. The sheep-raising, cattle-driving, wheat-growing country is going industrial.

Early in World War II the Dominion's defense needs prompted amazing industrial progress. Now expanding factories seek workers; jobs far outnumber applicants. Australia wants people—millions of them.

During the war some 2,000,000 Americans became acquainted with Australia and its sturdy, congenial people. Many married Australian girls and stayed. Ten thousand inquiries representing 20,000 potential migrants have been received from Americans. Financial assistance is offered immigrating veterans by the Australian Government.

"We want a million of these splendid GIs," said the Australian Minister for Immigration, "and could employ 200,000 right now if we could land them on our shores." He called for "men and women with the spirit of adventure, the old pioneering spirit of your covered-wagon days."

Given similar encouragement, more than 400,000 citizens of the United Kingdom have applied for admission since the war's end.

Map Reflects Wartime Surveys

The notable increase in world interest in the "land down under"—squarely "under" the North Atlantic Ocean—caused the National Geographic Society to choose Australia as the subject of its first 1948 supplement map. The geographic information which it contains is more detailed and accurate than was heretofore possible, because in Australia, as in many other regions, extensive new surveys and mapping projects were carried out during the war.

Trimetrogon aerial surveys made by the United States Army Air Forces completely mapped the continent's little-known north coast, resulting in much changed detail in that wild area. Valuable base material was provided by the Australian Government's 1:1,000,000 map sheets covering the continent.

The new National Geographic map's scale of 1:6,000,000, or 94.7 miles to one inch, is large enough to show all cities and important towns and villages. The map, 31½ x 25 inches, even locates homesteads in the continent's vast open spaces. It contains 4,418 place names.

Scale variation is held to a minimum by use of the new Chamberlin Trimetric Map Projection, developed by the National Geographic Society and previously used in its map of Canada, Alaska, and Greenland in June, 1947.

Highways and railroads are shown, and an unusual feature is the inclusion of a small, square black symbol to show the many railroad points where goods and passengers must be transferred because of changes in the width of tracks.

In Australian colonial times, when most of the railways were developed, each colony built its own line on its own gauge, with no thought of a continental system. Even today each State manages its own lines, and the many different gauges have not yet been standardized. This adds to the transportation handicap imposed by the great central desert lands.

To go from Cairns, in the northeast, to Perth, in the southwest, a shipment would travel from Cairns to Brisbane on a 3-foot 6-inch gauge; from Brisbane to Albury on a 4-foot 8½-inch gauge; from Albury to Port Pirie through Melbourne and Adelaide on a 5-foot 3-inch gauge; then to Kalgoorlie on a 4-foot 8½-inch, and on to Perth on a 3-foot 6-inch again. Each change in gauge requires unloading and reloading in different cars.

Though supplemented by many feeder lines in the more thickly inhabited sections near the coasts, and by "dead end" lines south from Darwin and north from Adelaide, this roundabout transcontinental line avoids the continent's great "dead heart." It is as if the United States were serviced by one transcontinental railway running from Maine to California by way of Jacksonville, New Orleans, and El Paso.

Inhabitants Cling to Coasts

To picture Australia, with its 7,500,000 people clinging largely to coastal and urban areas, imagine the United States as unpopulated except for the residents of New York City. Spread the bulk of these along the Atlantic seaboard, scattering a few handfuls inland; drop some around Key West and garnish the Gulf shore between southern Florida and New Orleans; then skip over to Los Angeles and deposit the rest.

* Members may obtain additional copies of the new map of Australia (and of all standard maps published by The Society) by writing to the National Geographic Society, Washington 6, D. C. Prices, in United States and Possessions, 50¢ each on paper; $1 on linen; Index 25¢. Outside United States and Possessions, 75¢ on paper; $1.25 on linen; Index, 50¢. All remittances payable in U. S. funds. Postage prepaid.

Australia and the United States are nearly identical in size, but less than a third of the half-arid continent gets 20 inches of rain a year.

The map shows the scarcity of mountains and permanent lakes and streams. Here is not a single glacier, and no perpetual snow fields, except in some secluded hollows on 7,305-foot Mount Kosciusko. Compared with river-chiseled Alpine Europe, most of the Commonwealth from an airplane looks as smooth as a newly made bed.

Flattest and most regular in outline of the continents, Australia is also unique in the fantastic creatures which have developed and survived there throughout centuries of seagirt isolation.

Among them are that strange egg-laying mammal, the platypus; the kangaroo; the lovable little koala; the fairy wrens; and the laughing kookaburra bird.

Black aborigines, the most primitive people left on the earth, still roam the Australian wastelands, hunting their food with spear and boomerang. Some, nowadays, make excellent stockmen.

Much of the vast desert interior is uninhabited. In the south, on the Nullarbor (No Tree) Plain, travelers see not a single tree along the world's longest stretch of straight railway—328 miles.

Thousands of Wells Water Livestock

Yet, in some areas, abundant water lies under the barren, sunbaked earth. Beneath 600,000 square miles in interior Queensland and the northeast quarter of South Australia extends the Great Artesian Basin, supplied largely by rains which fall in the east-coast mountains.

Water seeps inland through natural pipe lines, tilted strata of porous rock, and is tapped by more than 7,000 wells, which vary in depth from 10 to 6,000 feet. Thus water is provided for the huge herds of sheep and cattle that graze on the grassy plains.

In the northwest the map also shows the Desert Artesian Basin. Similar basins underlie the Nullarbor Plain and a large area east of Adelaide.

Where rainfall works its alchemy, trees, flowers, and people thrive. In eastern Queensland, for example, lavender jacaranda blossoms trace streets of frequent towns. Crimson bougainvillea half smothers bungalows. Heady frangipani fragrance hangs in the air. Banana plantations march up and down abrupt slopes. Sugar-cane fields in emerald waves sweep rich coastal plains. And people know the smell of earth after rain.

About half of Australia's people live in six big cities near the sea. Sydney, with a population of 1,398,000, is the fourth largest city in the British Commonwealth, being surpassed only by London, Calcutta, and Bombay. Melbourne has 1,184,000, Brisbane 394,000, Adelaide 370,000, Perth 240,000, and Hobart, Tasmania, 72,000.

Much smaller is Canberra, Australian capital, with only about 15,000 in the Capital Territory. Inset maps give close-ups of Sydney and Melbourne.

East Supports Heaviest Population

Cradle and crucible of the nation, the rainier eastern seaboard still supports the heaviest human concentration, the busiest iron and steel centers. Here the majority of immigrants will live and work.

Most of Australia's major coal mines lie within the wet east and southeast, though Western Australia also produces considerable quantities of coal.

Gold accounts for Kalgoorlie in the western desert; without a 350-mile pipe line from hills near Perth it would die of thirst.

A promising powerhouse for increased industrial activity, neighboring Tasmania holds hydroelectric possibilities greater than all the mainland's. It contains 74 percent of Australia's total potential water power. The vanguard of some hundreds of Polish immigrants is already working along its lines of water diversion.

Rich in dairy farms, fruits, cattle, and sheep, this island State (shown in an inset) is like a transplanted England.

Manufacturing Makes Rapid Strides

Wool and meat, grain and gold still make up the bulk of Australia's exports; yet today its manufacturing earns about 60 percent of the national income, compared with 39 percent in 1937-38.

Machines and methods molded in World War II now make aircraft, ships, automobiles, electrical appliances, textiles, pottery, medicinal drugs, and many kinds of luxury and consumer goods customarily received from abroad. Every trade or profession has its vacancies.

Close at hand is the overcrowded Far East, and Australia's two and a half persons per square mile contrast strikingly with Japan's 469 or Java's 817. But to the Occident, not to Asia, this continent-country looks for large-scale immigration.*

* For further articles on Australia, see the "Cumulative Index to the National Geographic Magazine, 1899-1947, Inclusive," $2.50.

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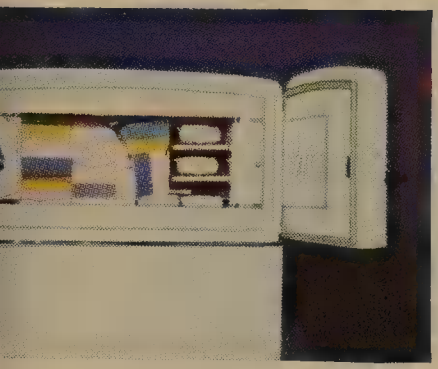

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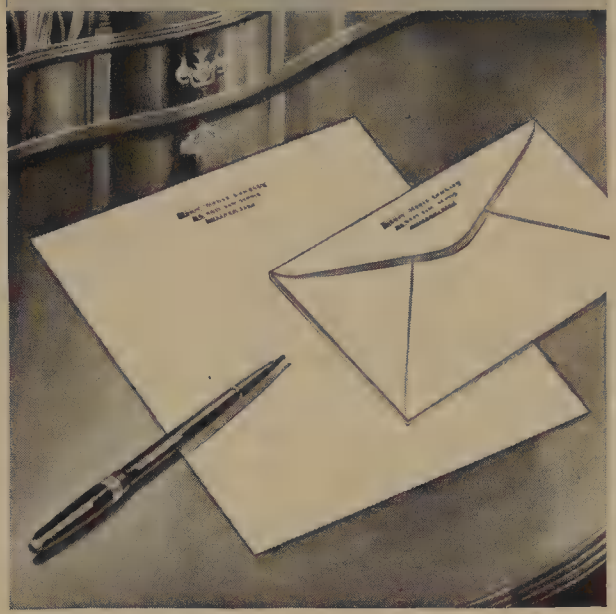

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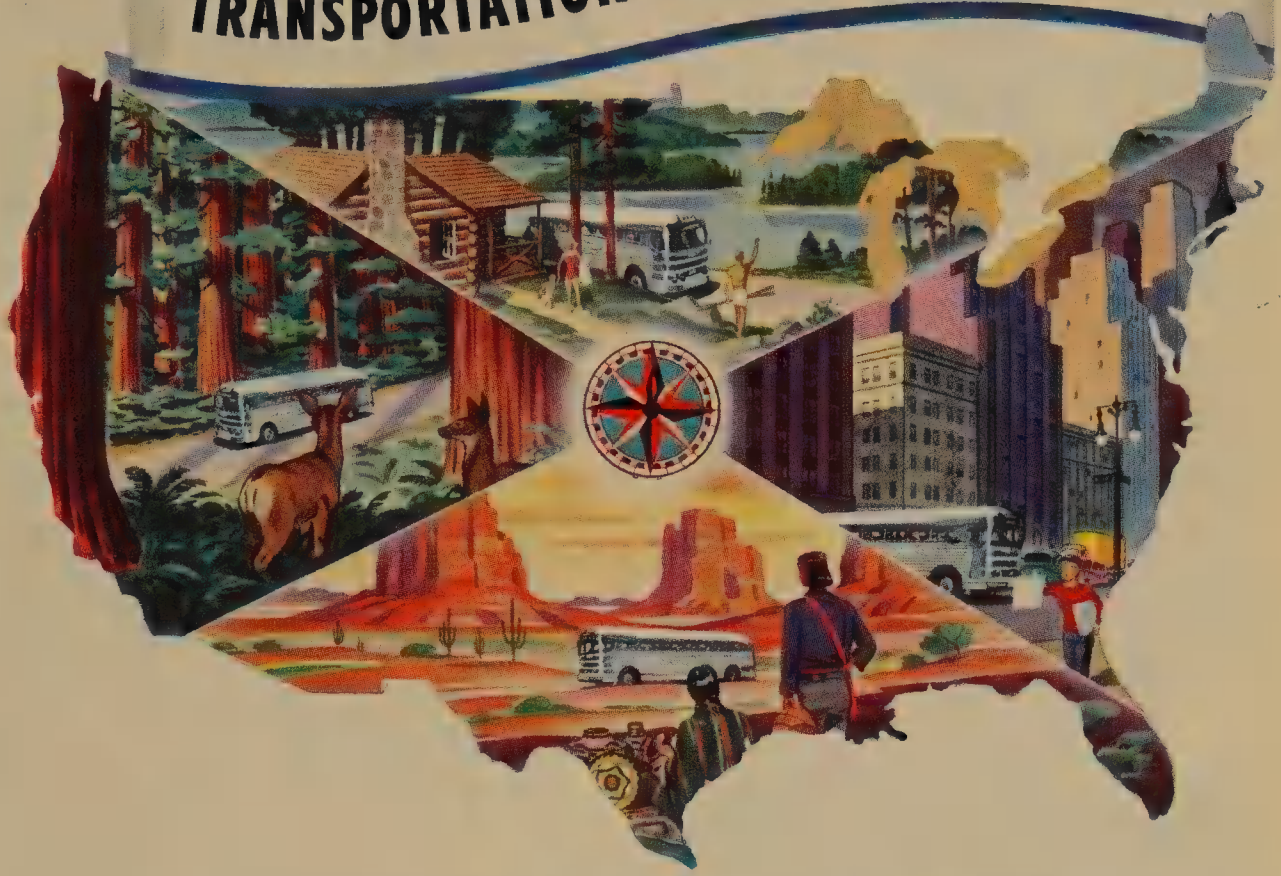

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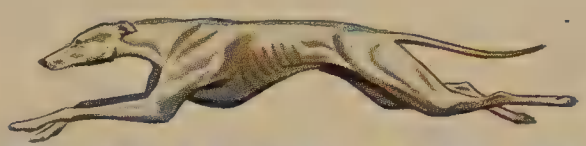

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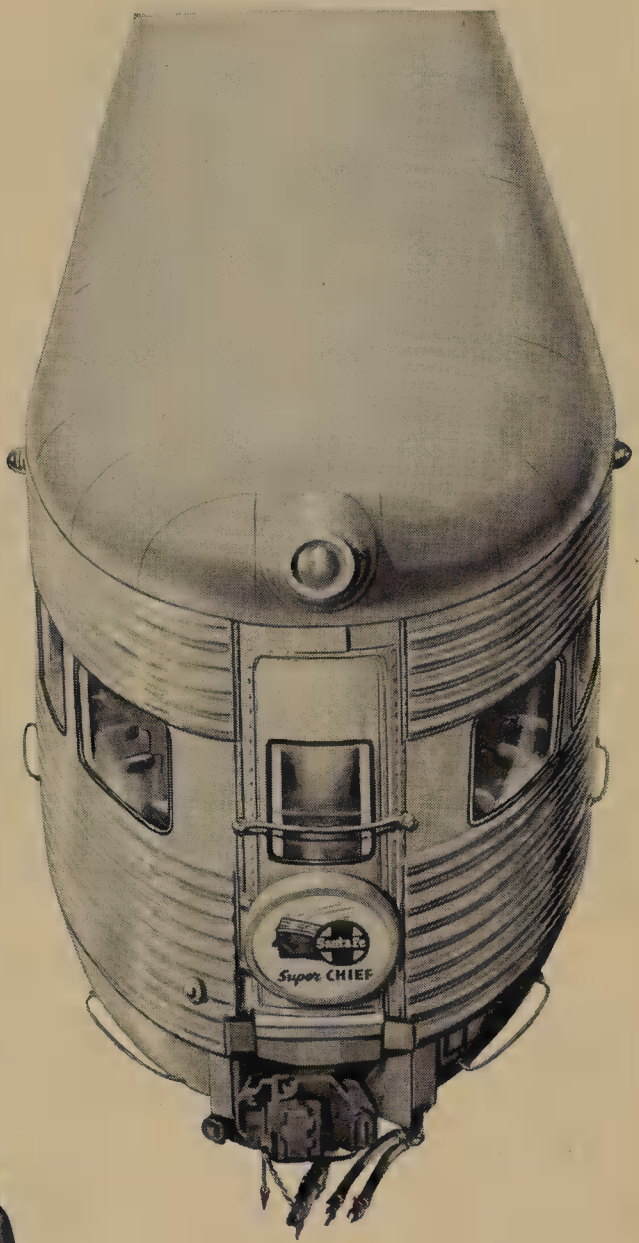

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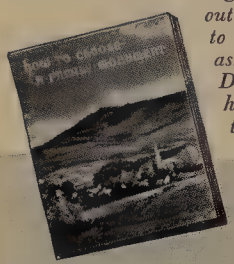

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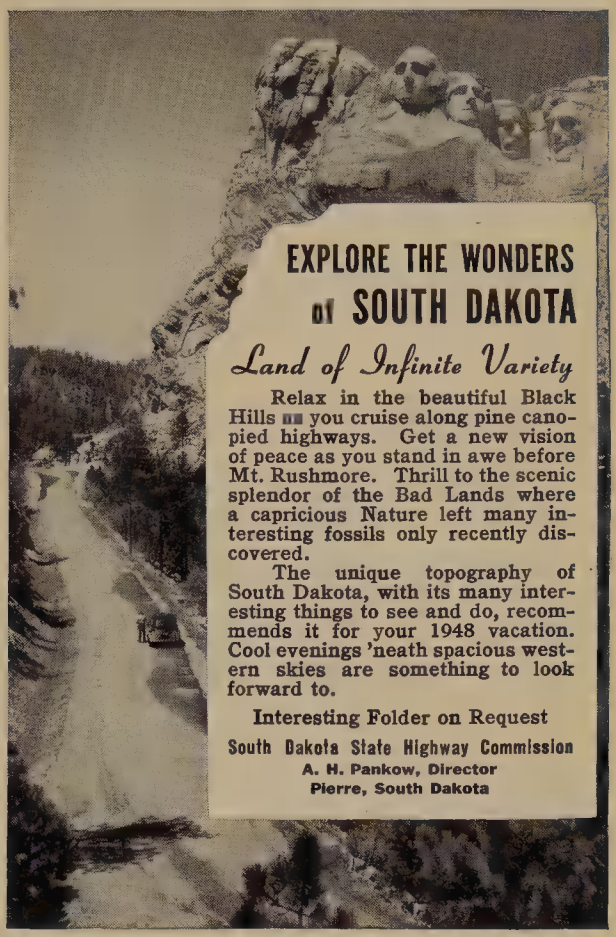

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In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

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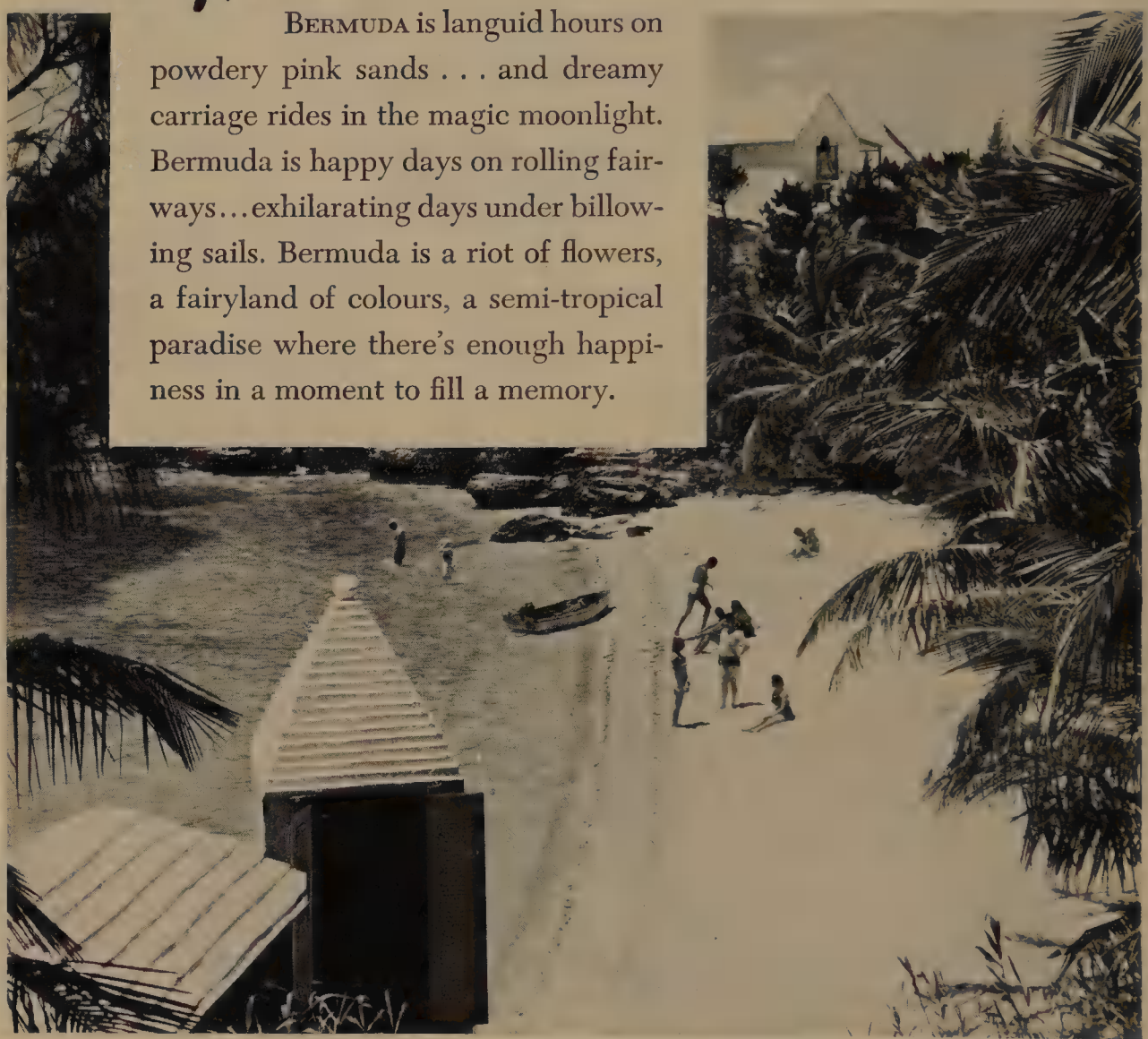

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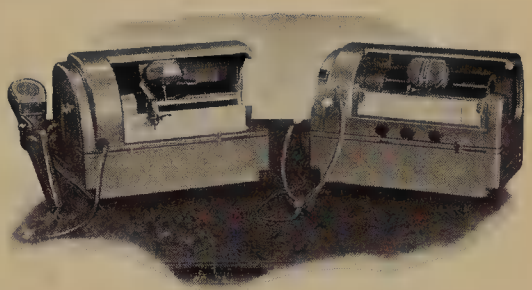

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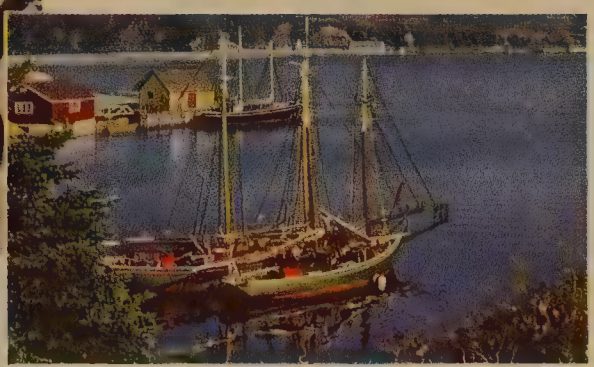

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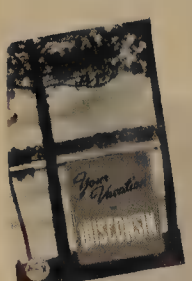

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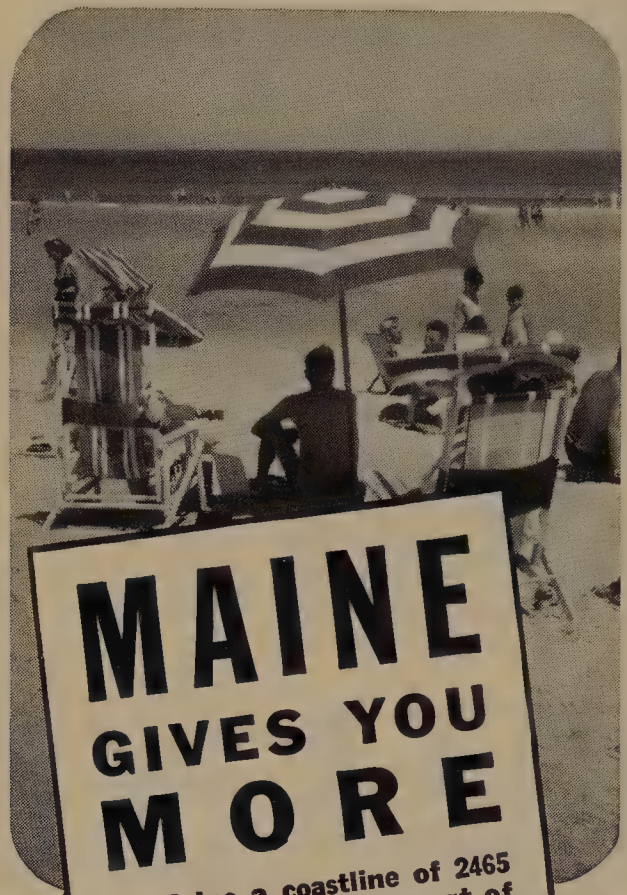

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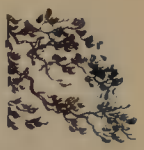

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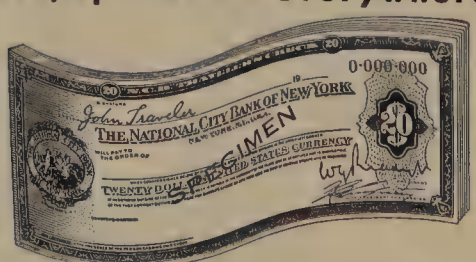

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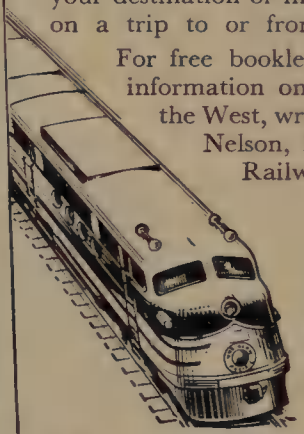

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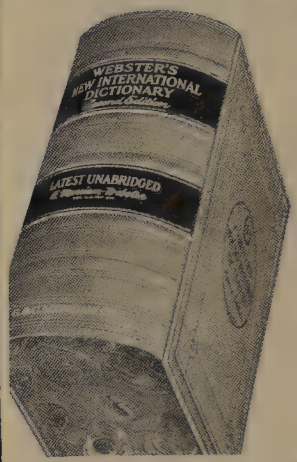

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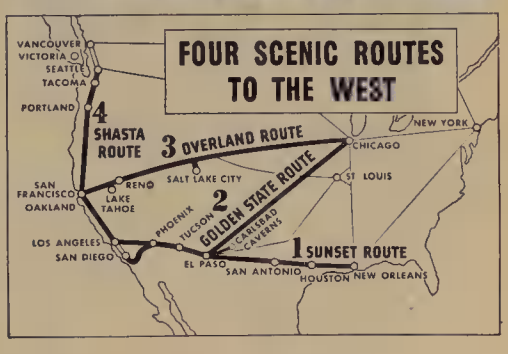

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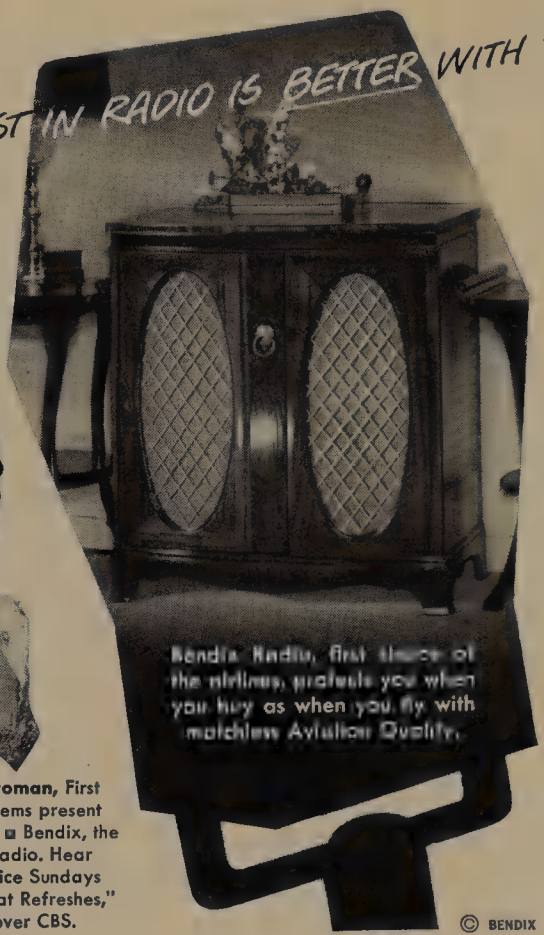

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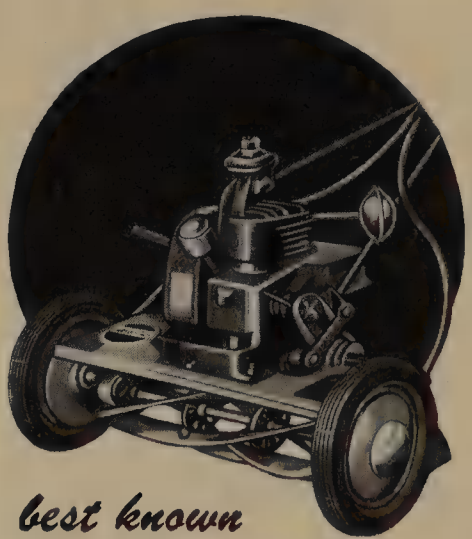

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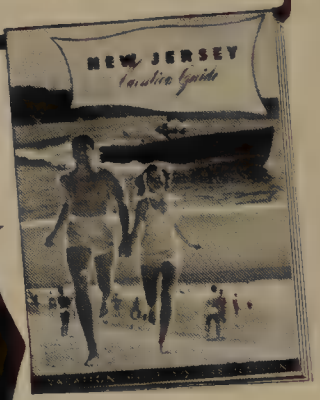

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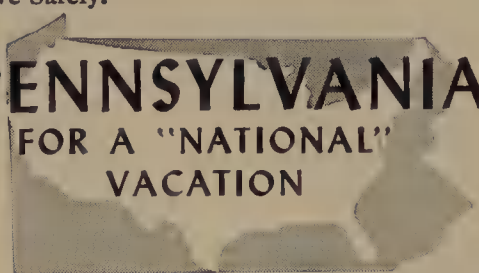

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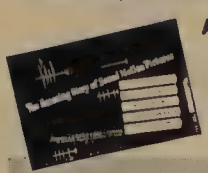

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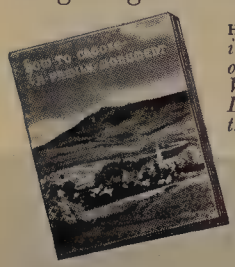

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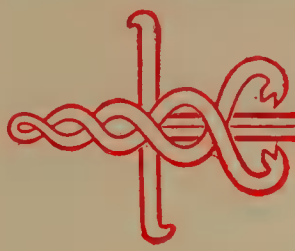
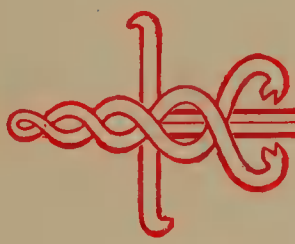


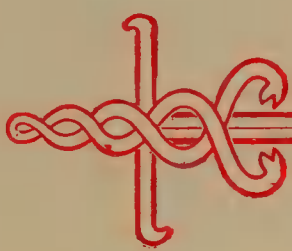
YOU are the first line of defense!

Alertness is your job. It's up to you to note cancer's warnings early, while chances of cure are best. That's why you, and everyone, should learn cancer's "danger signals" (they are listed below), and tell your doctor at once if any of these warnings appear. Sometimes cancer gives *no* warning, so it's also wise to have a thorough medical examination at least once a year.



The second line of defense is diagnosis!

This is your doctor's job. The "danger signals" are NOT sure signs of cancer, so it's up to your doctor to find out their cause. In many cases the doctor may advise further examination at a cancer clinic or hospital, or by a specialist. If he does, don't be alarmed. The chances are you don't have cancer. For example, out of 654 women who visited one clinic because most of them had suspicious symptoms, *605 or 92½ per cent were found to be completely free of cancer!*



The third line of defense is treatment!

There are still no drugs, no pills, no "sure cures" for cancer. The only treatments that have been successful are *surgery*, which removes the cancer, *and radiation*, which destroys it. Success often depends upon starting treatment early. Medical experience shows that the chances of effecting a cure *are much greater* when proper treatment begins in the early stages of the disease.

These are cancer's "danger signals"

1. Any unexplained lump or thickening, especially in the breast. **2.** Any irregular or unexplained bleeding. **3.** A sore that does not heal, particularly about the mouth, tongue, or lips. **4.** Noticeable changes in the color or size of a mole or wart. **5.** Loss of appetite or continued unexplained indigestion. **6.** Any persistent change in normal elimination. **7.** Any persistent hoarseness or unexplained cough. **Pain is *not* an early symptom of cancer.**

To learn more about protecting yourself from cancer, write for Metropolitan's free booklet, 48-N "There's Something YOU Can Do About Cancer."

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GENERAL ELECTRIC

RADIO-PHONOGRAPHS

179-G2

VOL. XCIII, No. 4 WASHINGTON APRIL, 1948

THE NATIONAL GEOGRAPHIC MAGAZINE

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Founders of Virginia

By Sir Evelyn Wrench

With Illustrations by Staff Photographer B. Anthony Stewart

THE founding of Virginia makes an epic story. It is not possible to read of the adventures and sufferings of the pioneers and settlers without a thrill. Among those ordinary folk were many heroes whose names we shall never know, but they played their part in the expansion of the English race across the Atlantic—one of the great dramas of history.*

Surely in this dramatic story of Virginia and its founders the "unknown settler" deserves to have his place of honor. We have the tomb of the Unknown Soldier at Arlington National Cemetery, and in Westminster Abbey, but no monument to the unknown Virginian; yet we cannot overestimate our debt to him.

When we look around the world today and thank God that there are 260,000,000 free men and women all speaking the English tongue, we do well to remember there were fewer than 5,000,000 at the time of the Spanish Armada.

The thousands of our stock who shared that western exodus in the early decades of the 17th century came chiefly from southern England (map, p. 437). Among them were discharged soldiers; farm laborers displaced by the ruinous policy of land enclosures; peasants dissatisfied with their humble lot; younger sons of worthy families; and decent souls who longed to worship God in their own way.

The first steps in the founding of Virginia were taken in the reign of Queen Elizabeth, but in all fairness some share of the credit is due to her grandfather and father.

Henry VII comes into the picture because in his reign John Cabot and his son Sebastian sailed from Bristol in 1497 and traced the northeast coast of North America.

Had the Cabots not made that voyage, there is every likelihood that the ruling tongue in Virginia today might be Spanish instead of English.

Henry VII was as miserly as his burly son was prodigal. This is why he spent but £300 on colonial enterprises. When Bartholomew Columbus sought to arouse the monarch's interest in his brother's scheme, his mission failed because, he was told, there was "no present profit in the enterprise"!

Cabots Left Few Records

When Cabot had his interview with Henry VII, the monarch had grown wiser; he had, of course, heard of the Columbus journeyings, and he must have rued his refusal to Bartholomew Columbus. He now gave permission to "our well-beloved John Cabot" to sail uncharted seas, but with an eye on the main chance he demanded one-fifth of the profits.

If the Cabots have not been tendered their rightful place in the annals of discovery, this is doubtless due to the fact that they left no proper records, as did Columbus. Much of our scanty knowledge of the subject in its early stages comes through letters from Italians resident in London.

Lorenzo Pasqualigo, writing in August of 1497, after the first voyage, tells us how Henry VII had promised Cabot ten ships for the next spring.

* See, in the National Geographic Magazine: "Tidewater Virginia, Where History Lives," May, 1942, and "Potomac, River of Destiny," July, 1945, both by Albert W. Atwood; "Approaching Washington by Tidewater Potomac," by Paul Wilstach, March, 1930; and "Restoration of Colonial Williamsburg," by W. A. R. Goodwin, April, 1937.

Tower of London "Beefeaters" Tread the Walk Where the Imprisoned Raleigh Exercised

As a captive in Bloody Tower (left), Sir Walter Raleigh wrote his *History of the World*. Since the wall on the right did not then exist, sailors on the Thames could see him pacing back and forth (page 437). As this is a holiday, the yeomen warders wear their scarlet state dress, dating from the time of Henry VII or Edward VI. In the distance is a part of Tower Bridge, which spans the river.

The letter adds that the King had given him "money with which to amuse himself till then, and he is now in Bristol with his sons and wife . . . vast honour is paid him; he dresses in silk and these English run after him like mad, so that he can enlist as many of them as he pleases."

Nevertheless, the reception accorded to Cabot on his return was very different from the wonderful welcome given to Columbus by Ferdinand and Isabella at Barcelona. There is a terse entry in the Privy Purse account recording the gift of £10 "to hym that founde the new isle," and the fact that he also received a pension of £20 a year, which he did not live long to draw.

When Spain's claim to world domination had to be challenged, Elizabeth was ready, in no small degree because of her father's interest in naval matters and coast defense. Henry VIII and his minister had built the dockyards of Woolwich and enlarged those of Deptford on the Thames (both now in metropolitan London) and built forts on the south coast; he had founded Trinity House in London as a school for pilots, and popularized everything to do with the sea.

There is an entertaining account from the

pen of the French envoy of the launching of the *Princess Mary*. He was an eyewitness, and we learn that Henry VIII "acted as pilot and wore a sailor's coat and trousers made of cloth of gold, and a gold chain with the inscription 'Dieu et mon droit,' to which was suspended a whistle which he blew nearly as loud as a trumpet."

A number of circumstances had been conspiring to identify the Virgin Queen with North American colonization. During her reign we can watch the beginnings of one of the most exciting periods in the history of the English-speaking peoples; all England was looking westward. The harbors of the south had caught the prevailing "Spanish fever"; younger sons out for adventure, sea dogs, explorers, pirates, and traders yearned to join in the crusade against Spain.

The Elizabethan age ought to have witnessed the settlement of Virginia. It might have done so had Raleigh's expeditions settled on the Chesapeake and not Albemarle Sound.* By their failure the colonization of North America by England was delayed till the reign of King James I. Nevertheless, "to Raleigh belongs the credit of having, first of Englishmen, pointed out the way to the formation of a greater England beyond the sea."

Drake's Potatoes and Raleigh's Tobacco

In the popular mind Drake and Raleigh are usually regarded as the introducers of potatoes and tobacco into England. I remember as a boy suddenly coming upon a statue of Drake, "the discoverer of the potato," in the little town of Offenburg in southern Germany. These "rare plants" were certainly growing in Lord Burghley's garden in the Strand, London, in 1596.

Raleigh was apparently "the first Englishman of rank to smoke." I wonder how many of the smokers of Virginia tobacco today realize with what disfavor the seductive weed was regarded in the heroic age of Virginian exploration.

Both James I and Sir Edwin Sandys, the champion of Virginian rights, shared an utter dislike for it, although the latter recognized its importance as a valuable export from the young colony.

Sandys referred to tobacco as a "deceavable weed" which "served neither necessity nor for ornament to the life of man, but was founded only upon an humour which might soone vanish into smoake and come to nothing."

In a debate during the reign of James I a Member of Parliament stated that "tobacco hindereth all the kingdom in health and otherwise"; another worthy Member wanted "to pull it out by the roots"; while Sir J. Horsey thought "not to speak of this vile weed," and added when he was first a Parliament man "this vile weed was not known."

Hakluyt's Part in the Birth of Virginia

Richard Hakluyt is only gradually coming into his own as one of the prime movers in the settlement of Virginia. Although he never crossed the Atlantic, his was the mind behind most of the colonization projects, and his was the pen that preserved for posterity the records of that wonderful age.

Hakluyt was educated at Westminster School, within the shadow of the Abbey, a seat of learning patronized by the sons of wealthy Virginians and Carolinians in the 18th century (Plate IX). While at school he saw a map depicting recent discoveries, and the Psalmist's account of "the wonders in the deep" became a living reality to him. And he fell under the spell of Humphrey Gilbert, who was to "settle" Newfoundland.

In the hundred years prior to his birth most of the great voyages of discovery had taken place. Bartholomew Diaz had rounded the Cape of Good Hope, Vasco da Gama had reached India,† Columbus had explored the Caribbean, and the Cabots had sailed along the northeast coast of North America.

His object was to preserve for future generations the records of the part Englishmen were playing in exploration, and above all to convince his countrymen that their true interest lay in oceanic trade and colonization.

While at Oxford—he was at Christ Church—Hakluyt tells us he read "whatsoever printed or written discoveries and voyages I found extant . . ." While serving as chaplain to the English Ambassador in Paris, he continued his studies of Portuguese, Spanish, and French exploration, and made "diligent enquiry of such things as might yield any light unto our western discovery of America."

An Early Ship News Reporter

At the age of 30 he published *Divers Voyages Touching the Discoverie of America*. He was appointed to a prebendal stall at Bristol Cathedral, and in no place could he have been more at home, because the West Country was

* See, in the National Geographic Magazine: "Bit of Elizabethan England in America," by Blanch Nettleton Epler, December, 1933; "Motor-Coaching Through North Carolina," by Melville Chater, May, 1926; "Tarheelia on Parade," by Leonard C. Roy, August, 1941; and "Exploring America's Great Sand Barrier Reef," by Eugene R. Guild, September, 1947.

† See "Pathfinder of the East," by J. R. Hildebrand, November, 1927.

Elizabeth as She Looked at the Age of 53

This London monument, standing over the vestry door of St. Dunstan-in-the-West, is one of the two statues of the Queen which are believed to have been made during her lifetime. St. Dunstan, mentioned as early as 1237, escaped the Great Fire of 1666 by a few yards.

humming with the exploits of the seamen just back from the Spanish Main.

Hakluyt could almost sniff the tang of the Bristol Channel from his study. When his religious duties permitted, he had but to stroll to the near-by quay to check his information at first hand. He was a careful historian; once he rode to the Norfolk coast to obtain information from the survivor of an expedition.

In 1587 he wrote to Raleigh, encouraging him to persevere in his Virginia enterprise: "I can see great comfort of the success of your action, hoping that the Lord, Whose power is wont to be perfected in such weakness, will bless the foundations of this your building. Only be you of valiant courage and faint not, as the Lord said unto Joshua exhorting him to proceed on forward in the conquest of the Land of Promise."

While Hakluyt was busy with what Froude calls "the great prose epic of the modern English nation," Michael Drayton, the poet, thus referred to the plantation of Virginia by the Queen:

> Who sent her navies hence
> Unto the either Inde and to that shore so green,
> Virginia, which we call of her a Virgin Queen.

Hakluyt, now a prebendary of Westminster, was among those who petitioned King James for the Virginia Charter in 1606; as a member of the Virginia Company he followed closely the stirring events of the next decade and witnessed the realization of some of his hopes. He is buried in the Poets' Corner of Westminster Abbey, and there is a tablet to his memory in Bristol Cathedral.

Raleigh must be reckoned as an Elizabethan, for his endeavors to settle "Virginia" took place before King James came to the throne. There are associations with Raleigh in many places in southern England, and above all in Devon. He was essentially a man of Devon and spoke with a Devonshire accent all his days.*

He was born at Hayes Barton farmhouse, thatched and three-gabled, near East Budleigh, ten miles from Exeter in the vale of the River Otter (Plate II); there he must often have talked with sailors back from the sea; Millais' familiar picture, "The Boyhood of Raleigh," was painted in Budleigh Salterton rectory.

* See "Down Devon Lanes," by Herbert Corey, National Geographic Magazine, May, 1929.

England, Mother of Virginia, Is Dotted with Shrines Venerated by Americans

In front of Hayes Barton farmhouse is an Old World garden. In the kitchen we found a crescent-shaped settee, dating from Raleigh's time, facing the open hearth.

Upstairs is the four-poster in which it is believed he was born, and "Raleigh's little smoking room." In various places the visitor is shown the spot where Raleigh is supposed to have had his first smoke!

In All Saints' Church, East Budleigh, "the mother church of the district," near Hayes Barton, we can see the Raleigh family pews, and on one of them the family arms are carved.

In our school days we read of Raleigh's gallantry to the Queen. It was not in Devon, however, that he put down his cloak for Elizabeth to walk on, but more likely near Canonbury Tower in north London. One of the tragedies of his life was that, while he schemed and poured out his wealth to found an empire overseas, he was never to visit Virginia.

"For several years Raleigh belonged to the Court, the recipient of the Queen's bounties to an extent which gave much occasion for scandal," but trouble was near. He committed the serious crime, from the Queen's point of view, of falling in love with one of her maids of honor, Elizabeth Throgmorton.

Victim of a Jealous Queen

The Queen never did things by halves. When she heard of the romance, she had Raleigh and the young lady locked up in the Tower of London. It is curious that the marriage should have begun and ended there.

Subsequently they were released and settled down at Sherborne Castle, now in ruins.

Near by is the house which Raleigh started to build but never lived in. During World War II it served as an American hospital, and in the autumn of 1946 I observed American personnel in a jeep careering along the Dorset lanes which Raleigh knew.

During Queen Elizabeth's later years Raleigh was restored to favor. We read that he was in daily attendance at Court in 1597. "In the evening he rid abroad with the Queen and had private conference with her."

With her death, however, hard times lay ahead; King James confined him for a dozen

In St. Ethelburga's, Henry Hudson Took Communion Before His First Voyage of Discovery

Dating from 1390, the church stands on Bishopsgate in the London financial district. It has defied time, wreckers, Great Fire, and blitz. Three stained-glass windows commemorate Hudson's voyages.

years in the Tower of London, whither his wife repaired to join him and where one of his sons was born.

Raleigh's last two years were dogged with misfortune. He obtained a release by subterfuge in 1616 and set out on a last expedition to Guiana, again in search of El Dorado.

After a series of disasters he returned to Plymouth, in June, 1618, and here his wife rejoined him with terror in her heart. How she must have wished that he had remained at the Tower of London, completing his *History of the World,* instead of embarking on a barren expedition with almost inevitable punishment ahead (page 434).

The mystery of his burial place will probably never be solved. He was executed on October 29, 1618, in Palace Yard, Westminster, and his body undoubtedly lay for some hours in St. Margaret's Church. This claims to be his burial place (Plate V), and there, incidentally, is a window to his memory erected in 1882 by American admirers.

There are, however, other factors to be considered. Beddington Church, in Surrey, situated in an oasis of the Old World that has escaped the engulfing tide of modern suburbia, also claims to be his resting place. The church that existed in Raleigh's time is still there, and the home of the Carew family. Raleigh's mother-in-law was a Carew.

The red-brick wall still stands that may have sheltered the first oranges grown in England. Local legend has it that they were planted from seed Raleigh obtained from Florida; the trees survived for 140 years but succumbed to the hard frost of 1739. I am told the original iron gates of the house are now in Virginia.

A Letter from Elizabeth Raleigh

After the decapitation of her husband Elizabeth Raleigh wrote to her brother: "I desire, good Brother, that you will be pleased to let me bury the worthy body of my noble husband, Sir Walter Raleigh, in your Church at Beddington, where I desire to be buried. The lords have given me his dead body though they denied me his life. This night he shall be brought to you with two or three of my men. God hold me in my wits."

It is not surprising, in view of this letter, that Beddington claims to be regarded as the resting place of Raleigh. The sorrowing widow would certainly have wanted to bury the body in some place associated with happy days and as far as possible from the scene of execution. If the body is here, it must be in the Carew vault, which was filled up with concrete half a century ago.

Anyhow, no more poignant picture of the days of King James comes down to us than that of poor Elizabeth, bearing with her all her days her husband's embalmed head in a red-leather bag.

West Horsley Place, also in Surrey, was inherited by Raleigh's younger son, Carew. The son buried his father's head in the local church, having received it from his mother on her death.

Sandys Helped Pilgrim Fathers, Too

I sometimes wonder why the story of the founding of Virginia has not received as much attention as the sailing of the Pilgrim Fathers. There would have been no *Mayflower* had there been no Virginian settlement; Sir Edwin Sandys, leading champion of freedom in the Virginia Company, was also connected with the voyage of the Pilgrim Fathers (Plate V).

When the exiles in Holland decided that they wanted "to live as a distincte body by them selves under the generall government of Virginia," it was to Sandys that Robert Cushman and John Carver came in 1617.

Sandys encouraged them in their project, and thanks to his help the Virginia Company was well disposed to them. In November that year Sandys wrote to the Reverend John Robinson, and to his old friend, Elder William Brewster, whom he had known since Scrooby days, encouraging the exiles in their undertaking.

American historians have done much in recent years to help us arrive at a fairer appreciation of the work of the men who sponsored the Virginian settlement in its early days, and we certainly owe them a debt of gratitude. I can never read the records of the Virginia Company without being deeply stirred. There is an entire lack of formality about its proceedings. It is almost as though we were in the friendly atmosphere of a family concern.

Of Christopher Newport, who piloted the expedition that founded Jamestown, little is known beyond the fact that he was a skilled navigator and made the journey to the colony five times. There is a reference to one stormy scene at the Company's deliberations, when, in a moment of tension, Sir Thomas Dale, the early Governor who brought back John Rolfe and Pocahontas with him, pulled the beard of Christopher and threatened to hang him! Anyhow, Dale certainly never carried out his threat, because Newport died in the East Indies.

To our modern way of thinking, it seems incredible that the Company never, apparently, had an office building of its own.

The members usually met in the London house of one of the leading adventurers; in Philpott Lane, where Sir Thomas Smith resided; in the house of Sandys in Aldersgate, and even, after the death of Nicholas Ferrar, Senior, in the parlor of his widow in Sythe Lane; or in the house of Henry Wriothesley (third Earl of Southampton) at Southampton House, Holborn.

The members of the Virginia Company concerned themselves with every manner of problem connected with colonization, and almost of necessity mistakes were made.

The doctrine was widely held that a colony was a place where the mother country's unwanted population could be dumped: too little attention was paid to the selection of the human material at the outset. Many misfits were sent across the ocean at first, but wiser counsels soon prevailed.

Capt. John Smith and others urged the need of sending men who could work with their hands. The Board soon took up this matter energetically, and on my desk lies a list of the settlers sent across the ocean in 1610. There were farm laborers, swineherds, millwrights, gunmakers, brewers, bakers, distillers of aqua vitae, hatmakers, apothecaries, ship carpenters, tinkers, tailors, bricklayers, biscuitmakers, bellowsmakers, fishermen, husbandmen, gardeners, and so on—all sound workers, and just the material urgently needed by a new country.

Ten years later, while Sandys was governor of the Company, it sent many ironworkers from Warwickshire, Staffordshire, and Sussex to help in the creation of the iron industry. Sandys held that there was "no better iron in the world" than the Virginia product.

"A New and Better England"

No body of men, not even the colonists themselves—called the "venturers," as distinct from the "adventurers," who remained at home—had the welfare of Virginia more at heart than the Company's liberal group. For the most part, they were not thinking of colonization in terms of immediate profit; they were inspired by the vision of a commonwealth across the seas where a new and better England would be created, and where the individual rights of the settler would be safeguarded.

Their purpose was nearly frustrated by James I, but the goddess of destiny stepped in. No sooner had the Company been dissolved than James I died; and luckily his successor, Charles I, was well disposed to several members of the liberal group.

The political rights which Sandys had won for the colony were allowed to stand; and an American historian has written that Jefferson's dream of human liberty was based on the ideals so dear to Edwin Sandys. Sandys and his friends must have discussed the fundamentals of democracy in the parlor of Mrs. Nicholas Ferrar, and in the homes of Sandys and Southampton with Francis Bacon, and, in all probability, with Shakespeare.

The meetings of the Company were by no means confined to matters of high policy, for there was the ordinary humdrum work of a colony more than 3,000 miles away to be dealt with. The settlers needed livestock; and shipments of cattle, horses, and swine were dispatched. We read that £10 per head was the fee paid to the shipper for each cow landed in good condition.

The acute shortage of women in Virginia was one of the main problems. In a note accompanying "one widdow and eleven maids for the people of Virginia," detailed instructions were sent to John Pountis, one of the Company's local officials, in these terms: "Most especially we recommend to you, Mr. Pountis, that at their first landinge they may be housed, lodged, and provided for of diet till they be marryed, for such was the haste of sending them away, as that straightened with time, we had no meanes to putt provisions aboard."

On one occasion the good vessel *Tiger* conveyed "fifty maydes" to Virginia, and the reception official (I wonder if he was our friend, Mr. Pountis?) was shouldered with the responsibility of "providing for them at their first landing and disposing of them in marriage (which is our chiefe intent); we leave to your care and wisdom."

Poor Mr. Pountis must have had his hands full; he combined the functions of a modern representative of the Ministry of Food, a matrimonial agent, and a billeting officer in one! Fortunately, there was variety in his job; if intending wives began to pall, there was other living cargo to be dealt with.

The vessel *Discoverie* was evidently a floating farm and menagerie, for it bore from England "divers sorts of seeds and fruit-trees as well as pidgeons, connies, peacocks, mastiffs, and beehives." I wonder who were the recipients of the peacocks!

Difficult times for the Company were now ahead. King James, egged on by the Spanish Ambassador, Gondomar, was jealous of its activities. The result of the machinations of the Crown party was the canceling of the Company's charter in 1624.

Fortunately, Sandys and his friends anticipated this move of their opponents; and when

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Like Sir Walter Raleigh of Virginia Fame, This Bobby Speaks with a Devon Accent

Clifford Jones, clasping daughter Dianne, represents the Devon Constabulary in Chagford. He carries no firearms except in emergencies. As a policeman during the blitz, he won the Defence Medal (ribbon).

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Devon Men Say Raleigh Smoked His First Pipe of Virginia Tobacco in This Thatched House, His Birthplace near East Budleigh

Elizabeth, for Whom Virginia Is Named, Is Shown in Wax

Owing to events shaped by Queen Elizabeth, Americans speak English rather than Spanish. Rejecting the King of Spain as a suitor, she harried his commerce and defeated his Armada. During Elizabethan times England planned the colonization of the New World.

In Madame Tussaud's waxworks exhibition, London, Elizabeth gets a hairdressing from an attendant. Her contemporaries are portrayed not strictly according to their relative ages. The group includes three children of Henry VIII —Elizabeth, Mary I, and Edward VI.

On the left is Queen Mary (Bloody Mary), Elizabeth's half sister. Beside her stands her victim, Lady Jane Grey, who, briefly proclaimed Queen, was put to death at Mary's command.

Edward, Elizabeth's half brother, had a brief reign.

Catherine Parr (right), as Henry's sixth Queen, was noted for her kindness to her three stepchildren.

From Elizabeth's unofficial title, the Virgin Queen, Virginia derives its name.

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Capt. John Smith Is Commemorated by the Lincolnshire School from Which He Ran Away

A mural in the Edward VI Grammar School in Louth represents the Jamestown Colony leader as the prisoner of the Indian chief Powhatan (right). Princess Pocahontas, on her knees, begs for Smith's life. Both Smith and Pocahontas are buried in England, she as the Christianized Lady Rebecca, following a visit to the Court of King James. Many years after Smith, the poet Tennyson attended this same school.

Two English Churches Claim Raleigh's Beheaded Body. His Burial Remains a Mystery

St. Margaret's, Westminster, displays this marker. A Surrey church disputes it. West Horsley claims the head.

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Sir Edwin Sandys, a Virginia Founder, Is Pictured on a Tomb (Third from Right)

As a theological writer, Sandys was remarkably tolerant for his time. A Member of Parliament, he championed democracy. Manager of the Virginia Company, he won political rights for the colonists. Jefferson's "dream of human liberty" has been ascribed to Sandys' ideals. In Southwell Cathedral he is shown, with other members of the family, on the tomb of his father, the Archbishop of York.

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Children Share Their Sweets Ration with Ponies Begging on the Walks of Lyndhurst. Often Baby Carriages Must Detour

Once a year the wild ponies are rounded up in the surrounding New Forest. Oak from this preserve built some ships that founded Virginia.

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Britain's Children Were Never Healthier; Grownups Make the Sacrifices

This hedgerow near Chagford, grown as a living fence, is typical of the Devonshire landscape.

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Love of Horses Shines in This Boy's Face

He attends a pony auction in the New Forest.

In Garlanded Straw Hats, Eton's Coxswains Dress for Action on the Thames

Each summer they parade before parents, standing up as crews row past. Afar: Windsor Castle Round Tower.

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Buttonhole Roses Fly for June 4, Birthday of George III, Eton's Friend

These boys wear classroom attire, which they often succeed in thoroughly rumpling. For play, they put on sports togs. Here, on visitors' day, they await their parents' customary treat.

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Where Colonial Virginians Studied: Ivy-clad Westminster School, in the Heart of London

On completion of classes these students, one bound for a distant cricket field, meet almost in the shadow of Parliament's Victoria Tower. Richard Hakluyt, historian of colonization times, attended Westminster.

In Stratford on Avon Lived the Genius of the Virginia Epic

Anne Hathaway's Cottage exists substantially as it did when William Shakespeare courted his bride-to-be. Still thatched and half-timbered, it contains relics known to Anne, and until 1899 members of the Hathaway family occupied the place. It stands in Shottery, a mile from town.

Before world travel became restricted, some 100,000 pilgrims visited Stratford yearly, and of these one-seventh came from the United States.

To many Americans, Stratford is the most sacred place in the British Isles. Possibly no other tie binds them so closely to Britons as their common possession of Shakespeare's works. In Stratford "the mind refuses to dwell," as Washington Irving wrote of the village church, "on anything that is not connected with Shakespeare."

In the poet's time Virginia's name was on every Englishman's lips. Shakespeare, however, wrote no drama about the new colony, then a virtual wilderness. In *The Tempest*, whose locale is Bermuda, he came close.

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Meat Is as Scarce as Flowers Are Plentiful at the Butcher's in Sherborne

Dorsetshire knew Raleigh and some of the founders of Massachusetts. Flowers hang in wire baskets.

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Tavern Signs Don't Reflect Dearth of Paint

Scarcity of beer is the problem at Minstead.

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Tourist-fed Gulls Grow Fat and Saucy in Clovelly, Nestling Against Atlantic Cliffs in Devon

Kodachrome by B. Anthony Stewart

The Family Car Lacks Petrol, but Who Cares if There's a Bicycle Built for Three?

New bikes, like new automobiles, go into export channels, so old ones are treasured. Holiday cyclists so crowd country roads that motoring becomes a hazard. One more addition to this London family will launch a handlebar basket. America's baby sitter has not become an English institution.

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Soldiers of the Fields, Struggling for Food, Are Heroines of England's Land Army

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What Chance Have Fish, So Plainly Outnumbered? Their Pursuers, Almost Shoulder to Shoulder, Line the Witham's Banks

These days, when so many pleasures are denied, fishing is increasingly popular. Club competes against club, village against village, in matches engaging thousands. Wives fish for their dinners. Week-end buses carry these sportsmen. Close by is old Tattershall Castle, which has a link with America.

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To a Returning Englishman, No Sight on Earth Can Equal the White Cliffs of Dover: St. Margaret's Bay, Kent

A Yank at Oxford Tries to Reconcile Study with the Distractions of Fatherhood

Stanley Sprague, a war veteran, has tough going as his daughters play with his mortarboard cap. A Rhodes scholar, he enjoys the generosity of Cecil Rhodes, who left a fortune to foster international good will.

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Dour Austerity Need Not Invade the Farm. This Family Can Grow Much of What It Needs

Sister serves brothers near Stratford on Avon. Cakes may be from home-ground wheat; tea is rationed.

the royal commissioners took possession of the official records, the liberal party had already taken steps to preserve copies of the Minutes during these vital years.

The preservation of these records has thrown much light on the early proceedings of the Company, and, above all, on the struggle made by Edwin Sandys to establish a settlement of a "free popular state" in the New World, where the English settlers would have "no government putt upon them but by their own consente."

The Saving of the Records

The story of the saving of the records begins with Nicholas Ferrar. At a cost of £50 to himself, he had an exact copy of the Minutes made. Each folio was compared with the original and initialed by the secretary of the Company, and Ferrar then took the volumes to Lord Southampton.

So delighted was the latter that he threw his arms around Ferrar and said: "Let them be kept at my house at Titchfield. They are evidences of my honour, and I value them more than the evidences of land."

William Byrd, of Virginia, bought the documents from the executors of Southampton's son half a century later; they found their way to Jefferson's library, and after his death to the Library of Congress, where they now rest and are referred to by Alexander C. Brown, American writer, as "the most precious volumes preserved in the Republic."

Southampton flits across the stage in the reigns of both Elizabeth and James. Literature was his chief interest, and he is best known as the patron of Shakespeare, who dedicated to him his early poems. He shared with Raleigh the experience of becoming enamored of one of the Queen's waiting women, also an Elizabeth.

When the Queen heard of her young attendant's love affair, she bundled her and Southampton into London's famous Fleet Prison for a time, and he was never restored to the Queen's favor.

When James came to the throne, one of his first acts was to release Southampton from the Tower, where he had been imprisoned, this time for treason.

By reason of his influential connections Southampton was to prove a useful friend to Virginia, and henceforth he devoted his energies and wealth to colonial enterprises. He equipped an expedition to Virginia and helped to expedite a voyage of Henry Hudson in his search for the Northwest Passage.

The last years of his life were intimately connected with Virginia, for he succeeded Edwin Sandys as governor (treasurer) of the Company, a position which he occupied for four years, till the canceling of the charter. Before the end of the year both he and his son died fighting in Holland.

They are buried in Titchfield Church, which has safely survived the war, even though it is in the neighborhood of Southampton.*

Another liberal member of the Virginia Company, Sir John Danvers, must have been an attractive young man. A contemporary described him as possessing "in a fair body an harmonicall mind," and a fellow traveler relates that when in Europe "the people would come out into the street to admire him."

His chief hobbies, apart from his interest in Virginia, appear to have been laying out gardens and architecture. He had a curious link with George Herbert, the poet, well-wisher of Virginia, and with John Donne, the Dean of St. Paul's, who preached a well-known sermon about the Virginian settlement.

Danvers, when little more than 20 years old, married George Herbert's mother, who was twice his age. Magdalen Danvers must have been a woman of great charm, for Donne wrote of her:

> No spring, nor summer beauty hath such grace,
> As I have seen in one autumnal face.

Lady Danvers was certainly a remarkable woman to have made a success of such a marriage. Donne is our authority, and he tells us that he saw much of their married life and that they lived happily till Magdalen's death; the partnership had lasted 19 years.

A "Pure Maid, Chaste Wife, True Widow"

Edwin Sandys' father, the Archbishop of York, was born at Hawkshead, close to Windermere.

In Hawkshead School the Archbishop's family Bible is preserved, with the entry of the birth of his second and famous son, on December 9, "At six of the clock in the morning of the year of our Lord God 1561" (at Hartlebury Castle, Worcestershire, which has been in tenure of the See of Worcester for more than 1,000 years).

The Archbishop is buried at Southwell Minster, and his wife is buried at Woodham Ferrers, Essex. "She lived a pure maid twenty-four yeares, a chaste and loving wife twenty-nine yeares, a true widow twenty-two yeares to her last."

* See, in the National Geographic Magazine: "Henry Hudson, Magnificent Failure," by Frederick G. Vosburgh, April, 1939; "Southampton—Gateway to London," by Stanley Toogood, January, 1940, and "A Modern Pilgrim's Map of the British Isles," issued as a supplement, June, 1937.

Edwin Sandys was a student at Corpus Christi, Oxford, where his tutor was Richard Hooker, but a few years his senior. Hooker was undoubtedly largely responsible for inculcating in him the love of freedom. In 1599 Sandys wrote *Europae speculum,* a work of great toleration to every religious sect.

Sandys was highly respected in Parliament and, with possibly the exception of Francis Bacon, also deeply interested in Virginia, no man enjoyed the confidence of the Commons to a greater degree.

One of Sandys' best-remembered speeches was delivered in the reign of James I, and could not have added to his popularity with the monarch. With views, as usual, much in advance of his time, he maintained that "the origin of every monarchy was in election; that the people gave its consent to the King's authority, on the express understanding that there were certain reciprocal conditions, which neither King nor people could violate with impunity; and that a King who pretended to rule by any other title, such as that of conquest, might be dethroned whenever there was force sufficient to dethrone him."

Sandys, having spent much of his later life in Kent, was buried in Northbourne Church, a couple of miles from Deal; and despite Nazi bombing of this portion of "Hell Fire Corner," it has escaped devastation.

For a time Sandys was a Member of Parliament for Sandwich, the picturesque and ancient port probably best known to Americans as the scene of international golf championships.

Sandys was married four times, and by his fourth wife he had seven sons and five daughters. Just when his struggle for Virginian freedom was at its height, he was in constant anxiety about his wife's health. As a matter of fact, she outlived her husband by eleven years.

One of the closest friends of Sandys was Nicholas Ferrar, who stood by him and Southampton in their struggle with the Crown.

A Bequest for "Higher Learning"

Nicholas loved Virginia, although he never visited the colony; he worked for its welfare during six strenuous years when he and his brother John were actively engaged in its management. The religious aspect of colonization made a deep appeal to him, and he longed to go with George Thorpe to convert the heathen. He also wanted to translate the New Testament "into the language spoken by the savages on the Virginia Plantation."

Nicholas was educated at Enborne near Newbury, in Berkshire, and at the age of 14 went to Clare College, Cambridge. His father, also Nicholas, was a leading Merchant Adventurer in the City of London and had been interested in the voyages of Hawkins, Drake, and Raleigh; so young Nicholas was brought up in an atmosphere of exploration.

He was but 14 when the expedition which founded Jamestown sailed from the Thames.

His father was the first man to bequeath a sum of money for "an American institution of higher learning"; he left the sum of £300 towards the cost of educating "infidel children" at the college to be established in Virginia.

His mother was a woman of deep piety, and it was undoubtedly from her that he inherited his burning faith and the desire to consecrate himself to the spiritual life.

When the battle for the Virginia Company was lost, Nicholas Ferrar decided to withdraw from the rough-and-tumble of ordinary life and devote himself entirely to prayer and meditation. Who can say how much we owe to the prayers and example of that little community of between 30 and 40 souls that he and his mother set up at Little Gidding, in Huntingdonshire?

A Patch of Unspoiled England

Little Gidding is not too easy to find. On the way thither we asked a farmer for directions and inquired apprehensively if the church had suffered from German bombs.

He soon set our fears at rest and laughingly replied: "You're not the first, by a long way, and won't be the last, who've not been able to find Little Gidding. Neither could Hitler!" In a neighboring field we noted some German prisoners hard at work.

My two visits to Little Gidding stand out as red-letter occasions. The church, one of the smallest in England, situated on a hillside near some farm buildings, looks out, as it did in Ferrar's day, on gracious uplands golden with buttercups and with lambs gamboling in the sunshine. If I were asked to show a visitor a bit of unspoiled England after this second World War, I would take him to Little Gidding.

The buildings in which the community lived no longer exist, but the little church still stands and is lovingly tended (page 462). The door is left open; the visitor can wander about at will. In front of the church door are the tombs of the two brothers, Nicholas and John; over the porch are the words, "This is none other but the House of God and Gate of Heaven."

Although Nicholas and John Ferrar were no longer responsible for the affairs of Vir-

Land's End, Americans' First and Last Sight of England, Warms Visitors with Tea

This spot, where the Cornwall peninsula juts into the Atlantic, is England's farthest west. Here many an America-bound settler got his last glimpse of the old country.

ginia, they constantly held the colony in their prayers. Nicholas, who had pledged himself to celibacy, was ordained deacon in his thirty-fifth year by Archbishop Laud in Henry VII's Chapel in Westminster Abbey. Edwin Sandys offered him preferment, but this he refused.

John Ferrar became the proud father of a little daughter on the first Christmas Eve at Little Gidding. John, in his life of his brother, relates that she was named Virginia, "out of their affection to the remembrance of the plantation of Virginia, which they so dearly affected, and that John Ferrar might daily more and more have the memorial of it so as not to cease praying for it."

J. H. Shorthouse gives a wonderful picture of life at Little Gidding in *John Inglesant*—Mrs. Ferrar, the mother, seated in her arm-chair, and around her the female members of the community, working with deft fingers at the famous Harmonies, so arranged that the four Gospels could be read separately or in one continuous history, "the printed text being cut out and pasted on large sheets of paper, and illustrated with engravings." They were richly bound by the ladies; two of the series are preserved in the British Museum (461).

George Herbert was said to have met Nicholas Ferrar only once, but this meeting was responsible for a lasting friendship, and Nicholas became to Herbert "his exceeding dear brother" and "his entire friend and brother."

Shortly before his death George Herbert desired to leave Bemerton for a living in Huntingdonshire, where he would be within reach of his friend. Herbert was deeply interested in Virginia.

Izaak Walton has described the scene at Herbert's deathbed. To the envoy whom Nicholas Ferrar had sent to Bemerton he said:

"Sir, I pray deliver this little book to my dear brother Ferrar, and tell him he shall find in it a picture of many spiritual conflicts that have passed between God and my soul. Desire him to read it, and then, if he can think it may turn to the advantage of any dejected poor soul, let it be made public; if not, let him burn it."

Nicholas Ferrar duly published *The Temple,* albeit after some delay because the authorities disapproved of the lines:

> Religion stands on tiptoe in our land,
> Readie to pass to the American strand.

Memories of John Smith

Historians have used much paper in discussing the writings of John Smith; as the early records have come to light, Smith's version of the founding of the colony is no longer exclusively relied on, but we cannot ignore

A Wigged Barrister Gets a Smoke

Taking a breather from court, this group stands in Lincoln's Inn Fields, London's law district. The statue of Sir Thomas More honors a successful lawyer whom Henry VIII put to death. Inspired by explorations of the New World, More wrote *Utopia* (Nowhere), the story of an ideal community.

him. He undoubtedly performed a useful service in drawing attention to Virginia's needs in the early years.*

I have recently revisited most of the places connected with his name. There is the quiet little village of Willoughby, in Lincolnshire, where he was born; the church must be very much as it was in 1580 when, according to the register still preserved, he was baptized at the old font.

Next we come to the King Edward VI Grammar School at Louth, not far away, where he was educated and from which he ran away (Plate IV). Smith's bust is preserved here, presented by Lord Baden-Powell, founder of the Boy Scouts, a descendant.

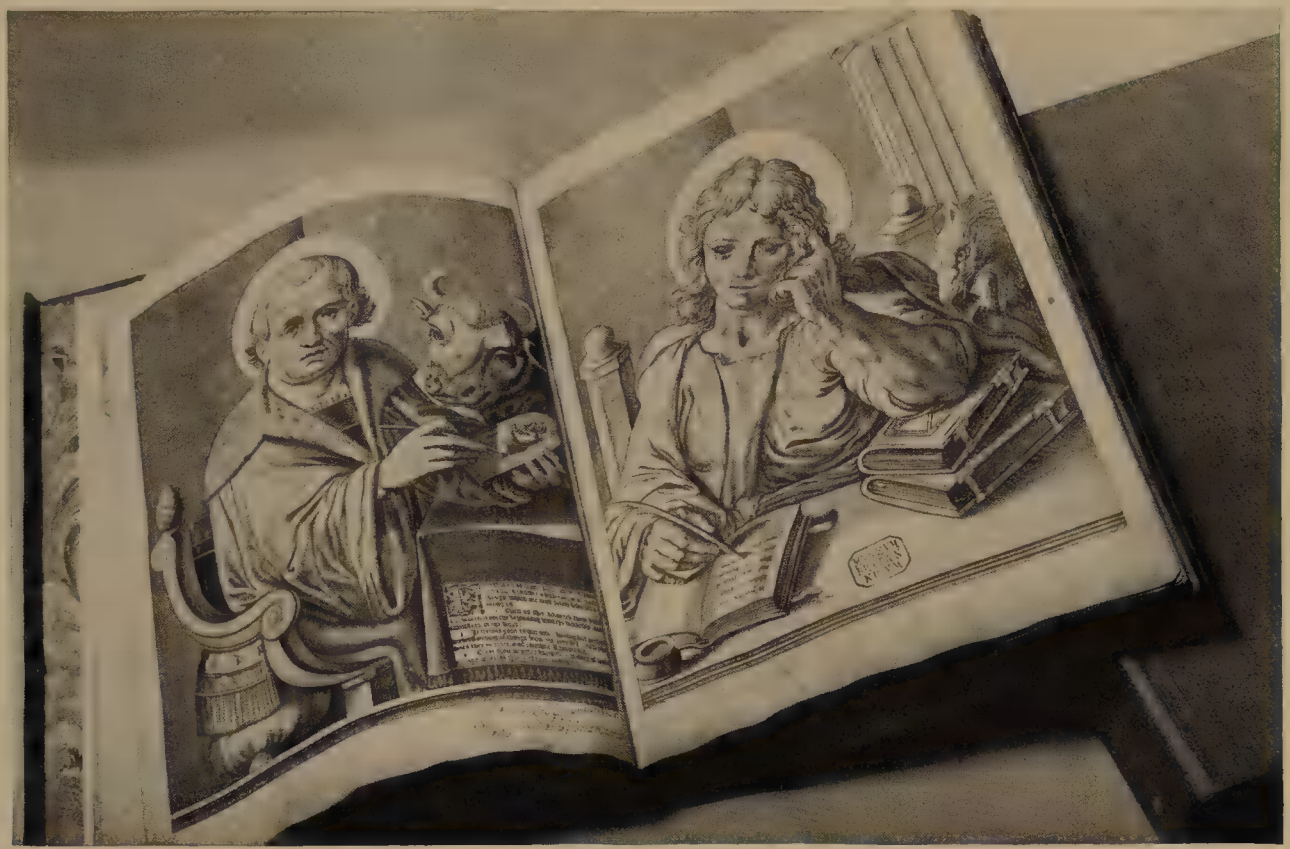
Smith's body rests under the altar of St. Sepulchre's near Newgate Prison, in London. There is a tablet to his memory in which he is described as "sometime Governor of Virginia," and on his coat of arms are three heads because of "the pagans he slew while fighting for the King of Hungary."

St. Sepulchre's stands in a much-bombed district and is lucky to have escaped, for a surprising number of churches were destroyed in the area, and it seemed almost as if the Prince of Darkness had been guiding the Nazi bombers. The Church of St. Giles, not far off, where rest the remains of another Elizabethan explorer, Martin Frobisher, has been destroyed too, although the tower still stands.

There are two other churches associated with Virginia in the neighborhood. St. Mary-le-Bow, where Patrick Copeland, "the first great missionary" that the Anglican Church produced after the Reformation, preached a sermon recording the Company's achievements in Virginia, is also in ruins, save for its glorious Wren tower. St. Michael's Cornhill, where other sermons on Virginian colonization were delivered, has luckily escaped.

The tragic figure of Pocahontas remains for but a brief moment on the stage as we watch the Virginian drama. "The Lady Rebecca" captured the imagination of Londoners during her brief sojourn, as was natural; for an American princess, married to an Englishman, who

* See "Chesapeake Odyssey (Following the Course of Capt. John Smith)," by John Maloney, National Geographic Magazine, September, 1939.



As the Founders Prayed for Virginia, Their Ladies Compiled Gospel "Harmonies"

Some 300 years ago the creation of harmonies was a favorite pastime in Little Gidding, an English religious community related to the Virginia Company (page 459). Bible texts and contemporary engravings were pasted on sheets of paper and handsomely bound. Nicholas Ferrar, Little Gidding's leader, left such a volume. The one shown is preserved in the British Museum.

"wore a hat and ruff and wielded a fan like a civilized fine lady," was certainly a surprising sight in Whitehall. She attended Ben Jonson's mask, and was presented to King James and his consort.

Samuel Purchas describes the visit of Pocahontas and her entertainment by the Bishop of London, when "she did not onely accustome her selfe to civilitie, but still carried her selfe as the daughter of a King, and was accordingly respected not onely by the Company [Virginia], which allowed provision for her selfe and sonne, but of divers particular persons of honour in their hopeful zeale by her to advance Christianitie."

Purchas thus records her death, for she soon succumbed to consumption: "At her returne towards Virginia she came to Gravesend, to her end and grave, having given great demonstrations of her Christian sincerity, as the first fruits of Virginian conversion."

St. George's Gravesend still stands, and is best known as the resting place of Pocahontas, "the darling child" of Powhatan, the first "American woman" to be buried on English soil. As one of her chroniclers says, "Hers was perhaps the first love story of the British Empire overseas."

And now we approach the exalted figure of Shakespeare in our brief story of the founding of Virginia.

Americans have given much time and research to the subject, among them my friend Prof. Charles Mills Gayley, of the University of California, alas, no longer with us. Shakespeare rightly interpreted the age in which he worked, and during 20 years of his lifetime Virginia attracted a great amount of attention in the motherland. One historian claims that the whole of England, judging from contemporary evidence, was as much absorbed in Virginia as was the United States in California in the days of the gold rush.

Writing of 1607 in his *History of the United Netherlands,* John L. Motley says:

"It was in this year that two words became more frequent in the mouths of men than they had ever been before; the words which, as the ages rolled on, were destined to exercise a wider influence over the affairs of this planet than was dreamed of by any thinker in Christendom." The two words were "America" and "Virginia."

Dr. Tobias Matthew, Archbishop of York, a contemporary, complained that Virginia was so much "in the news" that he longed for more

In Little Gidding Churchyard, Huntingdonshire, Lie Two Champions of Virginia

After dissolution of the Virginia Company, the brothers Nicholas and John Ferrar retired to a religious community here and prayed for the New World colony which they had helped to guide. John's daughter, born in Little Gidding, was named Virginia that she might remind him of the Jamestown endeavor. Parliament disbanded the Ferrar community in 1647. Its old farm cottages are no more, but the church, one of England's smallest, remains a shrine to American pilgrims (pages 458 and 461).

information concerning the countries of continental Europe, "for of Virginia there be so many tractates, divine, human, historical, political, or call them as you please, as no further intelligence I dare desire."

Matthew Page Andrews draws our attention to the fact that the famous Virginian charter was borne to America by the expedition that sailed in 1609, and that the "Charter Ship," the *Sea Venture,* was wrecked on the coast "of the still vex'd Bermoothes," immortalized in *The Tempest.* William Strachey's narrative is supposed to have provided Shakespeare with material for the play.

The name of Sir George Somers will always be associated with the great chapter of colonization, as, with Christopher Newport, he commanded the fleet of nine vessels that sailed from Plymouth in 1609. The ship which Somers was aboard was the one wrecked on Bermuda.

Certainly Virginia, if she had had the choosing of her sponsors, could hardly have brought together a more remarkable group of men and women.

We have the wayward, volatile, and yet fundamentally sagacious Elizabeth; Raleigh, the man of vision, whatever his personal ambitions and shortcomings; Hakluyt, the consecrated man of letters; John Smith, the "venturer"; Christopher Newport, the master mariner; George Somers, "a lamb on shore, a lion on sea"; Edwin Sandys, one of the great figures in man's march toward freedom; George Herbert, the "Saint of Bemerton"; Nicholas Ferrar, mystic and man of affairs; Southampton, courtier and patron of literature; and, in the background, the elusive shadow of the mighty Shakespeare.*

* For additional articles on Great Britain, London, Virginia, etc., see "National Geographic Magazine Cumulative Index, 1899-1947."

Around the "Great Lakes of the South"

By Frederick Simpich

With Illustrations by National Geographic Photographer J. Baylor Roberts

"FROM my front yard—if I could get down to it—I might look up now and see a 30-pound catfish swimming where wild geese used to fly," said an Alabama farmer. "Or up in what used to be the sky, I might see an excursion steamer from Cincinnati, a wheat barge from St. Louis, a speedboat race—or even a bevy of bathing beauties diving from a raft!"

Fantastic? No! This man's farm now lies in the bed of an inland sea, one of that long string of "Great Lakes of the South" created when Uncle Sam built dams in the Tennessee River and made it a part of nearly 15,000 miles of navigable inland and coastal waterways.

One of these lakes, formed by Kentucky Dam near Paducah, Kentucky, is 185 miles long (page 487). Some are so deep that in certain seasons you could let your hook down 60 or 70 feet and find fish (Plate IV).

For 650 miles downstream from Knoxville, Tennessee, across northern Alabama, then back north through Tennessee and Kentucky to where it flows into the Ohio, this river is just one lake after another; their total shore line measures as much in miles as our combined Gulf and Pacific coasts.

Barely 15 years ago this turbulent Tennessee—draining parts of Virginia, North Carolina, Georgia, Tennessee, Alabama, Mississippi, and Kentucky—what with its floods, land erosion, and wasted power, balked the welfare and progress of this populous region, which covers 40,910 square miles.

Now all that's changing fast.

Dams for Many Purposes

Today, multiple-purpose dams control floods, aid navigation, and provide electric light and power for millions in this area (map, pages 488-9).

This gigantic job began in 1933 when, by Act of Congress, the Tennessee Valley Authority, or TVA, was set up. Its nonpartisan board is named by the President, by and with the advice and consent of the Senate.

Rainfall in the Great Smokies drains into the Tennessee, and may reach 80 inches a year. By radio, telephone, and teletype, watching engineers know just what rainstorms are doing along the Tennessee River and its upper tributaries.

The 28 dams in this river system (of which 12 were constructed during World War II and two are under construction) form as many lakes. They stand, each a bit lower than the one above it, like a series of big bathtubs.

So, to control floods and still hold water enough behind the dams to run turbines and make power, the engineers simply open or close a water gate here or there, like turning a faucet on or off in a bathtub (map, pages 482-3).

Most Completely Controlled River

This makes the Tennessee now the most completely controlled major river anywhere in the world.

But for this control, high water as of old would still lay waste the Tennessee Valley and add to lower Ohio and Mississippi River floods. When you see how puny man has balked this wild river, you think of that Biblical tale of how God held back the waters of the sea while Moses' Israelites walked through with dry feet.

Since 1936, when the first dam above Chattanooga was built, 15 floods have started on the Tennessee River. The crests of all have been reduced. In the two largest, those of January, 1946, and January, 1947, flood stages at Chattanooga were reduced by 10 and 12½ feet. Total estimated savings in flood damages to that city alone are well over $20,000,000.

Similar benefits accrued all down the valley.

Kentucky Dam, which corks up the Tennessee near its mouth, helps cut down flood levels in the Ohio and Mississippi by from one to three feet.

For this magazine the writer covered the historic Ohio and Mississippi floods of 1927 and 1937.* Then, rowboats landed at the second story of a hotel in Paducah, drowned mules lodged on people's front porches, long reaches of the Lower Mississippi became vast inland seas, and some 600,000 people had to be removed to higher ground.

You can no longer blame the Tennessee for any part in such disasters.

Imagine the U. S. Coast Guard setting up navigation markers along new waterways which now lie over what used to be Alabama

* See, by Frederick Simpich, in the National Geographic Magazine: "Great Mississippi Flood of 1927," September, 1927; "Men Against the Rivers" (Mississippi and Ohio Rivers), June, 1937; and "Taming the Outlaw Missouri River," November, 1945.

"Lightning Hit You? O.K., More Juice Right Away!"

At central dispatching rooms in Chattanooga and at Wilson Dam, alert men are on duty around the clock. Wall diagrams show all switches in the TVA system; colored pegs show whether a switch is open or closed. Dispatchers, in constant touch with all power plants and substations, can instantly order power sent to any point in the system. For instance, if a plant is damaged by lightning, others step in to carry its load.

cotton fields! U. S. Army Engineers look after the locks in this newest of our navigable inland waters.

I knew Decatur, Alabama, as an inland town. Yet in the late war it built ocean-going freighters and sent them to sea—down the Tennessee. Lately I saw it building power barges for the French Government's use on the Rhine (Plate XV). Its flour mills haul in wheat from Midwest river ports.

Guntersville, Alabama, when I saw it first on a hot summer day, was a dusty cotton town. Few of its people had ever seen a ship.

Soon visitors may come by excursion steamer from Cincinnati, St. Louis, or even St. Paul, and a 9-foot water channel leads to such far ports as Pittsburgh, Minneapolis, St. Paul, Houston, New Orleans, Mobile, or even through Chicago to the Canadian ports of the northern Great Lakes!

"We built an elevator at Guntersville," writes the Norris Grain Company of Chicago, "feeling that distribution through that point would be advantageous to the South." The South, to a large extent a depleted area in grain production, must import considerable quantities to make its own bread and livestock and poultry feed.

Cargill, Incorporated, of Minneapolis, owns a terminal grain elevator on the water front of the big lake which now covers some of Guntersville's low areas.

Autos Shipped by Water

Flying over open water near Guntersville, we looked down and saw a strange craft packed with four decks of shiny new automobiles. This carrier belongs to Commercial Barge Lines, Inc., of Detroit. They wrote me:

"Now we have two new Diesel-powered 3-sectioned articulated automobile-carrying boats, the *Commercial Clipper* and *Commercial Express,* which can haul 602 automobiles per shipping (Plate V).

"We originate traffic for water transportation from various automobile-manufacturing points in Michigan, Ohio, Indiana, and Wisconsin. These cars are shipped from the river ports of Cincinnati, Ohio, and Evansville, Indiana, to the ports of Memphis, Tennessee, and Guntersville, Alabama, whence they are sent overland to dealers throughout the South and Southwest. . . .

"Besides automobiles, we carry general commodities, particularly hooded trailers."

Other barges, both common carriers and

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Ektachrome by J. Baylor Roberts

Forest Sprites Play on the Rhododendron-strewn Slopes of Great Smoky Mountains

Homes are few and far between in this wilderness of wild animals and primeval forests. Tributaries from the vast watershed flow down to feed the Tennessee River, turned now by dams into a chain of shimmering lakes.

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Ektachrome by J. Baylor Roberts

Farms and Gardens Flourish in the Valleys and Foothills of the Great Smokies, with Their Lush Climate of Hot Sun and Heavy Rains

From World's End, Visitors Flock to Study This Great Project

Here a group of 30 engineers from Siam inspects a mural of Norris Dam, which stands in the Clinch River near Knoxville and creates the beautiful lake of the same name.

After the lecturer has explained why and how the dam was built, how it helps control floods and aids navigation, the young Siamese will inspect the dam itself and its silent-running powerhouse.

Foreign observers, coming here by hundreds, want to see not only the multiple-purpose dams themselves and their relation to floods, navigation, and power generation but also what is being done to grow more trees, restore eroded farms, and stamp out malaria.

New industries seeking handy electric power adjacent to river and other forms of transportation now are locating in the valley.

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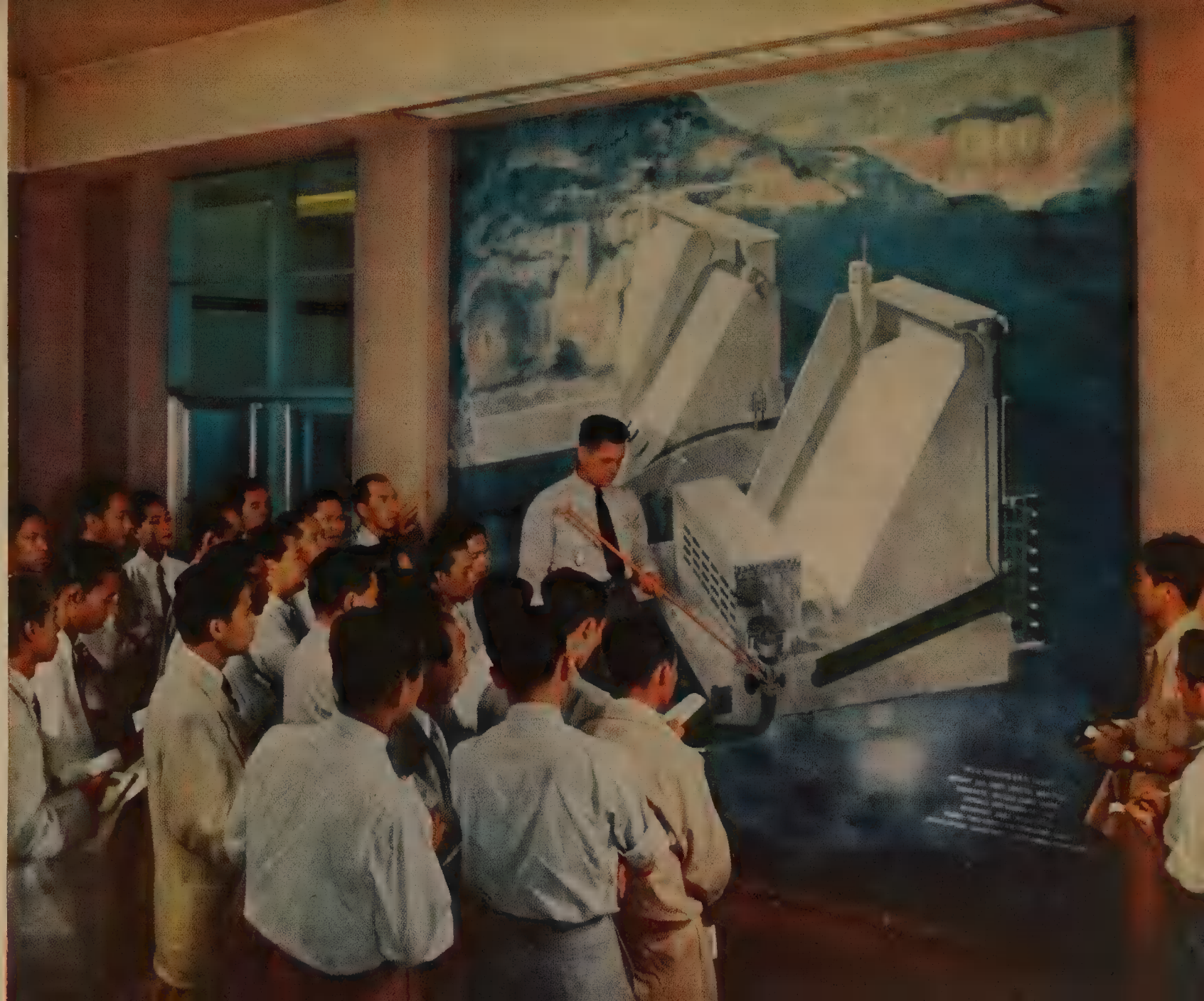

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Kodachrome by J. Baylor Roberts

"Look! I Caught Six Before I Needed a Fresh Worm!" Big "Cats" and Bass Are Caught in Swifter Water, Just below Kentucky Dam

New Cars Ride to Market by River Barge, Passing Here Through Guntersville Dam Lock

This giant 4-decker, the *Commercial Clipper,* can haul 602 automobiles at once. With its twin, the *Commercial Express,* it is a Diesel-powered, 3-sectioned craft, built especially for this inland water trade on the Ohio, Mississippi, and Tennessee Rivers.

New cars from factories in Wisconsin, Michigan, Ohio, and Indiana are picked up and assembled at such Ohio River ports as Cincinnati, and Evansville, Indiana. Thence they go by these giant barges to Memphis or to Guntersville, Alabama, for further distribution overland.

The big *Commercial* barges are 525 feet long, can make 17 miles an hour, and have a cruising radius of 2,300 miles.

Each vessel is made up of three 175-foot sections and can be separated into three pieces for convenient passing through locks. The three upper decks overhang the bow like a carrier's flight deck; the fourth platform is within the hull itself.

No crane is needed to load or unload cars; they simply run on and off over ramps to floating docks.

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Chattanooga, on the Tennessee River, Lies Below Lookout Mountain, Where Blue and Gray Fought That "Battle Above the Clouds"

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High above Imposing Fontana Dam, Which Blocks the Little Tennessee in North Carolina, a Husky Farmer Hoes His Hillside Corn Patch

© National Geographic Society

Ektachrome by J. Baylor Roberts

Phosphate Rock Turns to Fertilizer in This Electric Furnace at Muscle Shoals

Indians planted fish with their seed corn and beans so that phosphorus in the fish might fertilize their gardens. Phosphate-rock beds, some in Tennessee, were formed long ago by dying marine life. Today TVA's most valuable Nation-wide job is the manufacture of this triple superphosphate and its distribution to our impoverished soils.

Summer Visitors Now Stay in Cottages Once Used by Men Who Built Fontana Dam

Even the maid service is motorized in this model village beside Fontana's 30-mile lake.

© National Geographic Society

Kodachromes by J. Baylor Roberts

"It's Plenty Cold—Right Out of Our Old Oaken Bucket"

Lyda Benton brings the drink to her brother Clarence, 17, who won that new tractor for being the best 4-H Club boy farmer in Georgia in 1946. Lyda runs the tractor when Clarence works with his dairy herd.

© National Geographic Society

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Ektachrome by J. Baylor Roberts

Ready for Their Morning Dip, Girls of Lookout Mountain Colony Rest on the Rocks Beside Lulu Lake

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Kodachrome by J. Baylor Roberts

Bridle Paths Wind over North Carolina Hills Around Fontana Village, Comfortable Resort Managed by Government Services, Incorporated

Man-made Lakes on the Tennessee River Suddenly Bring Unexpected Water Sports to This Area

Here Chattanooga's Privateer Yacht Club repairs its snipe fleet and makes ready for a holiday regatta on Chickamauga Reservoir, upstream from Chattanooga.

These astonishing "Great Lakes of the South" not only afford unprecedented near-at-hand opportunities for fine fishing and bathing, but they also bring speedboat, cruiser, seaplane, and sailboat fans here from all over the Middle West.

The sportsmen's advent has started scores of new businesses, from lakeside lodges and boat-repair shops to sporting-goods stores.

Incredible numbers of rods, reels, life preservers, motors, boats, sails, masts, and anchors are sold here far from salt water. One Chattanooga dealer runs a special truck, bringing live bait from Indiana in tanks.

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Owners, Pilots, and Spectators Gather about the Outboard Motor Pits at Chickamauga Reservoir During a Fourth of July Dixie Regatta

© National Geographic Society

Kodachrome by J. Baylor Roberts

Fumes from a Copper Mine Killed Plant Life, and Erosion Finishes the Ruin of This Empty Area near Ducktown, Tennessee

The mine company now controls fumes and aids conservation. How to cure erosion and restore worn-out fields are lessons TVA teaches farmers.

© National Geographic Society

Kodachrome by J. Baylor Roberts

In the Ingalls Yards at Decatur, Alabama, Big Steel Barges Are Built for Use on the Rhine

France bought 25 of the self-propelled craft. They are shipped down the Tennessee and Mississippi to New Orleans, thence by sea to Rotterdam for assembly.

Industrial Research Institute, University of Chattanooga

Even a Blowtorch Won't Burn Chenille after Fireproofing

The tufted fabric patterned after "candlewick" spreads made by housewives in colonial times is now familiar in bath mats and bedspreads. Resemblance to a caterpillar suggested its French name, chenille.

© National Geographic Society

Ektachrome by J. Baylor Roberts

On a White Inspection Table She Hunts Flaws in Nylon Hosiery for Evening Wear

Nearly three miles of yarn go into one pair of 51-gauge stockings. Davenport Hosiery Mills, Inc., Chattanooga.

Garbage Cans Yield a Banquet for This Greedy Bear

Bruin gobbles the refuse noisily while Great Smoky Mountain visitors take his picture. Sight-seers always look for the bears, but they're a nuisance to National Park employees. Here, as in western parks, they may scratch or bite careless people who feed them or try to pet or tease them. A good rule is: "Don't monkey with a bear—the tamer they are, the more trouble they make."

privately owned lines, use this new waterway. Some towboats push 11 steel barges at a time; a tow of five or six 1,000-ton barges is the average.

Some oil companies use their own barges and have built their own terminals. Coal, grain, lumber, gravel, oil, gasoline, scrap iron, clay, aluminum, cement, machinery, and smaller shipments of peanuts, soap, stoves, canned goods, paint, glassware, and fertilizer move by water.

Several months ago Alcoa, or Aluminum Company of America, wanted to move some huge furnaces from its Alcoa, Tennessee, plant, to Iowa. It would have cost them too much to break these up into carload lots; so, after transporting them two miles to a dock, they used special barges, moved the heavy, cumbersome objects on board, and hauled them cheaply to destination.

For some kinds of freight, however, water transport is too slow. Also, if freight originates far from river ports, often shipments cost so much to reach the water that water transportation is defeated.

Till these lakes rose, and new roads ran up into the Great Smokies, people hereabouts enjoyed little in the way of water sports. Now dam and lakeside visitors number about 2,000,000 a year (Plates XII, XIII).*

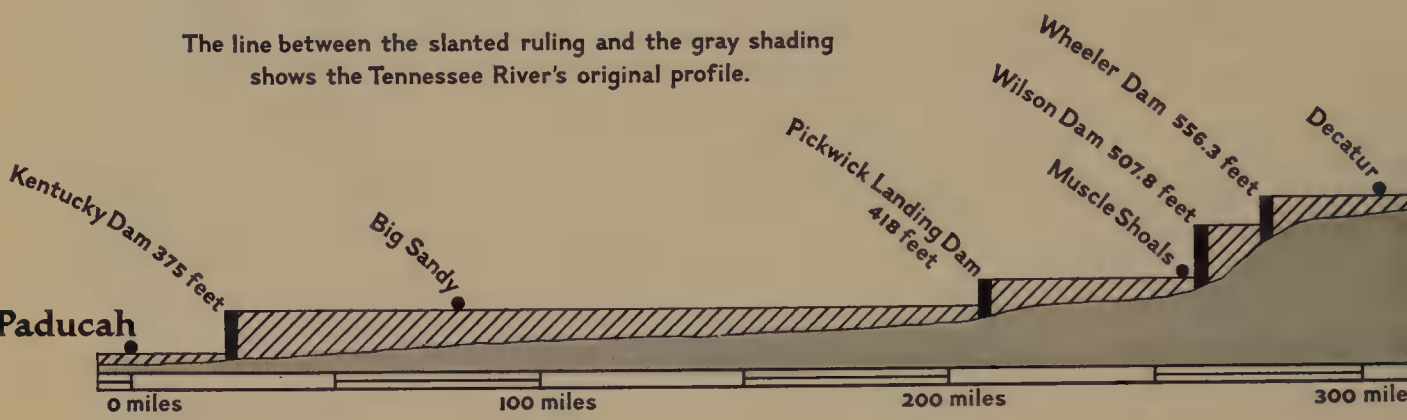
A Chicago mail-order house finds this one of its richest markets for boats, bathing suits, and fishing tackle. Floats, cabins, clubs, lodges, and summer camps line the lake shores, where some 7,000 powerboats, including those that take outboard motors, are in use. Many visitors ship their motorboats here, or haul canoes and skiffs on trailers or on top of their automobiles.

Big Lakes Bring New Kinds of Fun

"These new lakes, with all their outdoor sports, are having a fine moral effect on our youngsters," said one editor. "Our boys drink, fight, and loaf less in the poolrooms on their days off; now they want to swim, fish, sail, or race their speedboats. When we had only the muddy river, not so many could swim. Now you can push most any kid into the drink and he'll swim out, even if his stroke *is* dog fashion."

One weekday, at Guntersville Dam in Alabama, we saw more than 1,000 people

* See "Rambling Around the Roof of Eastern America," by Leonard C. Roy, National Geographic Magazine, August, 1936.



TVA Dams Stairstep Tennessee River; Figures Show Their Gate Heights above Sea Level

fishing. They had good strings; one man had caught a 30-pound paddlefish. Some men in boats fished the rapids boiled up by the turbines and caught big catfish just below the dam. Boys scooped up small bait shad by dozens in a dip net.

These tail waters on the Tennessee support 300,000 individual fishing trips per year. Most anglers fish from the bank. Huge signs warn the boat fishermen that these turbulent waters are dangerous for small craft.

On Galilee the Disciples caught no fish till they cast their nets in the right place. It's so here. Time is as important as place.

In spring, fishing is poor till water reaches a temperature of about 60 degrees, when most fish become more active. When the water is cold, some species are inactive. Fish are cold-blooded creatures. When temperatures are low, a single minnow takes care of their food needs for a number of days. But the walleye and sauger move and feed all winter.

Later so many tiny inch-long young ones appear that then the game fish can fill their stomachs with these, and they lose interest in chasing your plug, your minnow, or spinner.

Says Dr. R. W. Eschmeyer, TVA fisheries investigator: "Fishing is best in April, May, and June. In midsummer, at the height of the tourist season, angling here, as in most other parts of the country, is not at its best."

No Closed Season for Fishing

There's no closed season here; you can fish the year around.

When the several conservation departments discarded the closed season a few years ago, the catch greatly increased. Even so, TVA biologists find that most fish die from natural causes and so never reach the frying pan.

In the last few years TVA has tagged several thousand fish to see how much of the fish crop is being harvested. Some were taken in nets, tagged, and then released. In other cases sportsmen's clubs cooperated by taking the fish with hook and line for tagging.

The fish are marked with small numbered tags on the upper lip. That doesn't slow them down; one crappie, so tagged, was again caught on a hook the same day, thrown back, and caught twice the next day.

But only 84, or less than four percent, of some 2,500 fish tagged early in 1947 had been recaptured by the end of June.

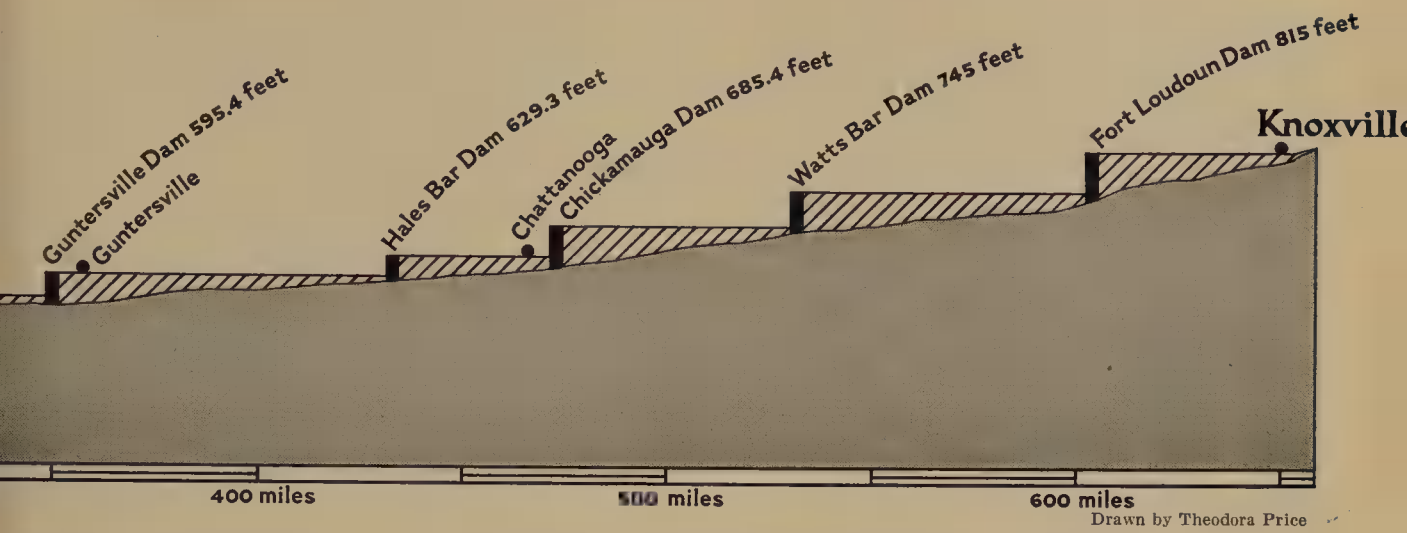
It's proved, too, that fish grow faster here, but live shorter lives, than those in northern waters. A few live to a ripe old age, but most of these fastgrowers must be taken during their first four years if they are to be caught at all. Few live to be five years old.

Many of these new lakes have never been stocked. Fish in them are children of pike, sunfish, cats, sauger, bass, crappie, etc., that swam the Tennessee and its tributaries before the dams were built. But it's known that the fish are multiplying enormously.

In April of 1945, for example, a man's average catch on Cherokee Reservoir was 3.2 fish. In April, 1947, the catch on this reservoir averaged nearly 10 fish. Many of the fish caught in 1947 were hatched without benefit of a closed season.

Fishing has become a major form of recreation on TVA waters. With 10,000 miles of shoreline, the angler has plenty of room to cast his plug.

From this chain of lakes fine roads now lead up into the Great Smokies, long an isolated region with houses few and far between. Parts of it, notably the virgin forests of the Great Smoky Mountains National Park, are still wild and unspoiled.



Nine Dams Transform the River Below Knoxville; Above and on Branches Are 19 More

A mamma bobcat and her three young ones romped in the road when cameraman Joe Roberts rambled out at dawn, looking for bears to photograph (page 481).

"These wildcats sneak around at night and rob our garbage cans," said the clerk at Fontana Village.

This camp took over as a pleasure resort when the army of workers moved out after finishing spectacular Fontana Dam, on the Little Tennessee River (Plate XI).

"It took 6,000 men to build this dam, but now it takes only four of us to a shift to run its power plant," said a turbine operator.

The vast hall which shelters the silent, powerful turbines is so gracefully designed and softly tinted it made me think Nebuchadnezzar's palace at Babylon must have been much like it. Even from Europe, architects have come here to admire this structure.

When building Fontana and other dams, TVA introduced rolling libraries; they took loads of books from one dam job to another for workers to read. When construction work ceased, people in the neighborhood wanted this book service kept up. At a public meeting, demanding books, Mrs. Willis Shadow said:

"We have 6,000 people in Meigs County, Tennessee, but no railroad, very few telephones, and no newspapers. The bookmobile and grapevine are our only means of communication. If we lose the library bookmobile, how shall we know what is going on in the world? There's not a family in the county the library doesn't touch."

So, after TVA showed the way, the State took over. The bookmobiles still run, and today more than 500,000 readers enjoy this library service!

White man's wampum is welcome at North Carolina's Cherokee Indian village on Route 107. Cowbells tinkle hereabouts; so do the cash registers in curio shops where copper-shaded Cherokee maids—some akin to pioneer Scottish traders—sell tiny drums, bows and arrows, and elaborate feathered headdresses (though the Cherokees themselves never wore them).

Sequoyah, famed Cherokee for whom the genus of giant trees was named, was born in Tennessee. He was a smart Indian. Intrigued by the "talking leaves" of the whites, he invented an alphabet for the Cherokees. The Gospel of St. John and other parts of the Scriptures were translated into Cherokee and printed in this alphabet. A missionary had special type faces made in Boston so the Cherokees could read their own language in their own "talking leaves."

If you collect miniature wooden rabbits, pigs, horses, or even turtles, you'll enjoy a day in the wood carvers' colony at Brasstown, North Carolina, on Route 64.

Power Cables Spread from Dams

All through these mountain valley floors you pass modest fruit, dairy, and grain farms. More important, to these farmers, than whittling out toy animals or sparking the bashful Indian maids is the electricity from the big TVA dams that now lights their homes and lightens the housewives' work.

Fly over any dam, with its hydroelectric plant such as that on Chickamauga Reservoir near Chattanooga, and you look down on what resembles the spreading web of a giant spider. That web is the net of copper and aluminum cables, carried on steel towers, to feed power and light to farms, towns, and cities. On wooded hillsides such cables hang in long straight lanes cut through the forests.

"If Fish Don't Bite Here on Fort Loudoun Reservoir," Says Pilot W. P. Cook of Alcoa, Tennessee, "I Just Fly Our Republic Seabee to Another Spot"

Dragging a Pole Set with Hooks along the River Bed, This Man and Boy Catch Mussels; the Pearly Shells Make Buttons

In Their "Bridge Game" This Junior Beauty Parade Breaks Step to Keep a Suspension Bridge from Swinging

Spanning a chasm in Lookout Mountain's spectacular "Rock City," the bridge carries a trail through that amazing labyrinth of caves, crevices, and canyons. Rock City is not a city, but the name of a geological jumble explored each year by hordes of visitors. Its caves are decorated with figures of dwarfs and goblins.

That Plane Is Not in Trouble! It's Spraying DDT on Watery Areas to Control Malaria

Where the poison mist falls, mosquitoes perish and their larvae cannot live. This flooded area lies near Big Sandy, in the Kentucky Dam region.

So much hush-hush hid it that few know what all electric power did here in the fighting years. TVA provides most of the power for the atomic bomb works at Oak Ridge.

More than half the elemental phosphorus we used in fire bombs, tracer bullets, and smoke screens came from TVA shops; so did trainloads of calcium carbide for artificial rubber, mountains of ammonium nitrate crystals, and other chemicals; and power from here made more than half of all the aluminum we used to build our fighting planes during the critical early part of the war.

Electricity and Its Users

Power production was stepped up to such a high rate in the war that people asked, "What are you going to do with all that stream of energy when the war's over?"

Well, today more electricity is being used here than ever before; so much, in fact, that hydroelectric plants alone can't meet the demand and coal-burning steam generating plants have to help out. TVA now owns 6,507 miles of high-tension power lines to distribute its energy to customers far and near. It owns also 1,000,000 acres of land.

TVA has a combination hydro and steam generating system with an installed generating capacity of 2,538,902 kilowatts, of which about 450,000 kilowatts is in steam plants. Its hydroelectric generating plants average about 13 billion kw-hr per year.

In a year of very low rainfall the output from hydroelectric generation may fall to 10 billion kw-hr. In the fiscal year which ended June 30, 1947, the TVA integrated system produced 14.797 billion kw-hr, of which 92 percent came from hydro plants.

Other electric systems of comparable capacity are Commonwealth Edison, serving Chicago, and Consolidated Edison of New York, with an all-steam generating capacity of 2,732,000 kilowatts.

So world-wide is interest in this big job that visitors come from far lands to see how it's done, and take the lessons learned here back to their own countries (Plate III).

Fleecy Clouds Float Lazily over Newly Built Kentucky Dam

To cross the Tennessee River, tracks of the Illinois Central Railroad are laid on top of the dam. At left are navigation locks. Below the dam, cultivated fields and patches of woods appear; above spreads the lake, 185 miles long, inundating former farms and pastures to create inlets and islands. With 2,380 miles of shore line, this is the largest body of water impounded behind any of the TVA dams.

Most observant was a Chinese engineer I talked with. He wanted to see how we have slowed down a racing river and made it "walk" through a basin nearly as large as England.

Here, with forty or fifty of his countrymen, he was learning what American methods and machines may do to help China battle the floods which for centuries have ravaged the unhappy valleys of the dangerous Yellow and Yangtze Rivers.*

Mosquito Control Methods Studied

Government officials, engineers, doctors, scientists, writers, and agronomists flock here from India, Russia, Poland, Britain, and France.

From Latin America, with all its problems of irrigation and undeveloped water power, have come more than 200 experts.

Australia sent a medical officer to see how TVA fights malaria. It kills mosquitoes by spraying marshy spots, lake edges, etc., with DDT and, lately, experimentally with 2,4-D, to kill aquatic vegetation which favors mosquito development. Some oil is used, but that method is largely outmoded.

Another method used is that of fluctuating the level of water behind the dams, during the mosquito breeding season, for a 5-day period. When water is thus lowered, grassy edges of lakes are left exposed to sun and dryness, which kill the larvae; when that's done, the level of water is raised again.

The dean of a Melbourne engineering school came to look into the cost of producing power and fixing rates. Brazil's Minister of Agriculture was here, and so was Lord Halifax when Ambassador at Washington.

A man from India's public works office came, and so did the senior engineer of the Niger River Project in French West Africa.

* See "Taming 'Flood Dragons' Along China's Hwang Ho (Yellow River)," by Oliver J. Todd, National Geographic Magazine, February, 1942.

De Soto
Mississippi River
ILLINOIS
West Frankfort
Harrisburg
Shawneetown
Wabash River
INDIANA
Evansville
Ohio River
Henderson
Owensboro
K E
MISSOURI
Cape Girardeau
Princeton
Cairo
Paducah
KENTUCKY DAM
Bowling Green
Hopkinsville
Poplar Bluff
Clarksville
Cumberland River
Kennett
St. Francis River
Mississippi River
Big Sandy
Kentucky Reservoir
Nashville
Paragould
Dyersburg
Blytheville
Jonesboro
Murfreesbo
T E N N E
ARKANSAS
Jackson
Columbia
Tennessee River
West Memphis
Memphis
Forrest City
PICKWICK LANDING DAM
Corinth
Florence
WILSON DAM
WHEELER DAM
Huntsv
Muscle Shoals
Wheeler Lake
Tuscumbia
Decatur
GUNTERSVILLE DA
Gunters
Clarksdale
Mississippi River
Grenada
MISSISSIPPI
Greenwood
Columbus
Birmingham
Fairfield
Greenville
A L A B
Bessemer
Tuscaloosa
Tombigbee River
Yazoo City
Vicksburg
Meridian
Selma
Alabama
Jackson

Power from 27 Big Dams Pulses Through an Area as Large as England and Scotland

Electricity developed by the TVA now flows throughout the vast unshaded region. Behind the dams spread the new "Great Lakes of the South," most of them born within the last 15 years. The Tennessee with its tributaries, the earth's most harnessed major river, yields flood control, water transportation, power, fertilizers, and recreation. Oak Ridge, the atomic city, grew up here during World War II. Besides 26 completed Tennessee Valley dams, Great Falls Dam, on the Cumberland River system, also contributes to TVA power.

Barehanded But Veiled, He Robs a Beehive Without Getting Stung

This Lincoln County, Tennessee, farmer participates in the TVA farm demonstration program, which helps the rural valley folk to take full advantage of the power and fertilizer produced at the dams.

Egypt's Minister of Public Health arrived to look at malarial and plant nutrition problems. Ontario's Minister of Planning and Development wanted to study social conditions and decentralized industry.

And students—busloads of them from Chile, Uruguay, Mexico, Turkey, Panama, and scores of other foreign countries—come; some stay from one month to a year and a half to see how TVA works—and take home the lessons.

Fossilized Bones Make Plant Food

As early as World War I, Uncle Sam built Wilson Dam at Muscle Shoals, Alabama, to make nitrogen compounds needed in explosives. Again in World War II that plant made munitions, and now it's making phosphate fertilizer.

Indians planted dead fish in their hills of corn to enrich the soil. We could, if we had enough fish; instead, we use as one kind of plant food the phosphates derived from phosphate rock.

To the whole Nation, of utmost importance is the making of concentrated fertilizer from this rock, which consists of petrified remains of marine life.

Major mineral requirements of a fertile soil are lime, potash, nitrates and other nitrogen compounds, and phosphates.

Lime is abundant. In the Southwest we have great potash mines. Nitrates we import from the natural beds in Chile or make from the air. Legumes also draw nitrogen from the air; pull up a pea or bean plant, or a bunch of clover, and those whitish nodules you see clinging to the roots are collecting nitrogen.

For phosphates the United States has about half of the entire world's known supply of phosphate rock. The biggest deposits are found in Utah, Idaho, Wyoming, and Montana, but the rock also exists in Florida and along the Tennessee River, convenient to TVA power.

This fact has been of great importance,

"Where Are You Going, My Pretty Maid?" "Going A-milking, Sir," She Said

But nowadays, thanks to electricity, she takes it easy. That milking machine, with vacuum cups slipped over Bossy's teats, does the work. Here on the Slagle Dairy Farm near Franklin, North Carolina, 115 cows are milked in 55 minutes.

because it has enabled TVA to perfect the electric furnace method of producing triple-superphosphate, a concentrate of extremely high plant nutrient value.

Fertilizer from Electric Furnaces

With electric furnaces using terrific heat at Muscle Shoals, Uncle Sam produces from these fossilized remains of long-dead marine life thousands of tons of highly concentrated phosphates, which cut down hauling and handling charges and have a remarkable effect upon soil productivity (Plate VIII).

TVA's output in the 1946-47 fiscal year was between one-fourth and one-third of the country's total production of concentrated superphosphate.

Teaching farmers everywhere what this concentrated phosphatic plant food can do to restore lost land fertility is one of the most valuable jobs TVA is doing.

All through this Tennessee River area I saw how worn-out farms are being reclaimed by erosion control and cover crops, through judicious use of phosphate from the big plant at Muscle Shoals.

Near Ringgold, Georgia, I visited G. C. Benton's farm. Lately it was a sad example of erosion and overcropping. Then Benton's 17-year-old son Clarence won about $1,600 worth of prizes in a State 4-H Club contest.

That boy, aided by a U. S. county agent's advice, put electricity and phosphate to work on his father's tired land. He's turning a worn-out cotton patch into a dairy farm. Among his prizes was a tractor, which his 15-year old sister Lyda handles as well as any man could.

TVA, as such, was designed especially to meet the peculiar problems of the Tennessee area. It couldn't be transplanted, in toto, to any other stream. But some lessons learned here could be applied to other streams. They are another story.

Harold Corsini from Standard Oil Co.

Bedouins, Camels, Goats, and Sheep, a Happy Desert Family, Camp Beside a Well at Al Jauf

Sheep, about twenty blacks to one white, put heads against fat tails (center) and blindly follow the leader. Goats, corralled on the side lines, are more independent. A pipe line, gift of Americans who drilled here for oil, leads to a Diesel pump. Black goat-hair tents of the nomads date back to Bible times.

In Search of Arabia's Past

By Peter Bruce Cornwall*

TODAY no other part of Saudi Arabia's desert kingdom is so progressive, so Westernized, and of such immediate world importance as the Province of Hasa, a long, narrow strip of bleak land bordering the Persian Gulf.

Under its rocky surface American engineers have tapped an immense oil deposit at Dammam Dome and have also proved three other rich fields.†

Some 4,000 Americans are now living in Hasa. A great refinery has been set up at Ras-at-Tannura (Plate X). Cottages, clubhouses, even a swimming pool, have been constructed.

A network of roads carries hundreds of trucks and motorcars, necessary to the working of this expanding industry, which is bringing wealth to Arabians and much-needed oil to Europe and America. But all of this growth is recent.

One hot day in September, 1933, American geologists came ashore and set up a small camp, headquarters for exploration that soon brought about one of the greatest oil developments in history.

Before that time Hasa was a secluded, forgotten land. A few Europeans had passed through on camels, a few others had landed briefly. Yet the history and topography of Hasa were little known. And no one knew what archeological treasures the region might possess (map, page 495).

As they went about their work, American oilmen came upon many thousands of round burial mounds. They picked up coins, beads, fragments of bronze weapons; they heard of statues and inscriptions, and saw evidences of many old, contrasting civilizations.

First to Delve into Hasa's Antiquities

In late 1940, I was suddenly given the rare opportunity to begin exploring Hasa. Thus I became the first archeologist to record its antiquities.

Crossing the Pacific and Asia by air, I arrived at oil-rich Bahrein Island only a few days after it had been bombed by Italian aviators in a daring attempt to knock out the island's great oil refinery.

It was an odd time for a scientist to appear in the Persian Gulf. But the Bahrein authorities proved sympathetic, and before crossing to the mainland I commenced work by opening a number of the island's famous burial mounds.

These round tumuli may number close to 50,000. They cover much of the northern quarter of Bahrein and range in height from a few feet to 82 feet. The largest, some 100 feet in diameter at the base, look like small pyramids.

Since American geologists reported that many acres of ground on the near-by Arabian mainland were covered with similar tumuli, it seemed possible that the mounds in both localities were relics of the same people.

The Bahrein Government generously put at my disposal an overseer with a gang of laborers to handle the pick and basket work. They were cheerful, willing men, often encouraging each other by shouts of "Yallah!" (O God!), or joining in a droning chant.

This custom of singing while at work is common in Arab lands, and Bahreini boatmen of the Shiite sect use for a chant the names of the grandsons of the Prophet, "Husain!" with a rising tone, "Hasan!" with a falling one.

Rings and Make-up Kits of Long Ago

I soon discovered that although most Bahrein tumuli belonged to the Bronze Age, at the northern end of the island were a few score elongated mounds dating from the Persian period and later.

In these I came upon plaster and rock cists containing skeletons, clay bowls, bronze finger rings, necklaces of beads, little make-up pots for women, and small alabaster jars.

And just under the surface of a street in Manama, Bahrein's chief town, I uncovered a strange council chamber holding nine seats in a circle (page 515).

The seats are un-Arab in appearance and seem to reflect Greek or Roman influence. The mystic number nine enjoyed special veneration in classical days. Who doesn't recall the nine Muses, or Lars Porsena's oath "by the nine gods"?

After more than a month's digging I crossed the shallow strait that separates Bahrein Island from Hasa. Then, with headquarters at Dhahran, the oil company's comfortable air-conditioned settlement, I set about making

* Dr. Cornwall has specialized at Oxford and Harvard Universities in Arabian history and archeology. His field work in Saudi Arabia was under the auspices of Standard Oil Company of California, the University of California, and Harvard University.

† See in the National Geographic Magazine, "Guest in Saudi Arabia," by Maynard Owen Williams, October, 1945, and "Bahrein: Port of Pearls and Petroleum," by Dr. Williams, February, 1946.

Teacher's Pet Gazelle Emulates Mary's Little Lamb in the American School at Dhahran

Dhahran, an oil center, is a bit of the United States 6,600 miles from home. Here the American colony enjoys air-conditioned homes, swimming pool, tennis courts, soft-ball diamonds, and hospital. Boy Scouts and glee club carry on the tradition. Two Americans and one Arab conduct a school for 50 children. To this wild-life class, teacher doubtless explains that English owes the word *gazelle* to the Arabic *ghazal.*

Harold Corsini from Standard Oil Co.

Oil Drum and Tin Can, Beaten by Hand, Serve a Hot Arab Band Deprived of Instruments

Not only music but liquor and tobacco are tabooed by the Wahabis, the puritanical Moslem sect controlling Saudi Arabia. These men, possibly Bahreinis, were found working on the 31-inch line of the Trans-Arabian Pipe Line Co. running from the Persian Gulf to the Mediterranean.

an archeological survey of the Province.

Field trips were made in two pickup trucks, my usual companions being an American geologist, two Arab drivers, and an armed soldier.

My first objective was a visit to the small port of 'Oqair.

Close to that place there is a ruin-field which some scholars believe may mark the site of ancient Gerrha, one of the "lost cities" of Arabia.

In Greek and early Roman times Gerrha was a famous emporium of the Middle East.

It probably was founded by Chaldean refugees from Babylon, and into its warehouses poured tons of frankincense, spices, and many other goods from south Arabia, India, and even Africa.

At that period the trade routes linking Europe with the "fabled East" ran through the Persian Gulf and Arabia, rather than the Red Sea.

So the merchants of Gerrha grew ever richer, till they were said to rival the famous Sabaeans, and to possess "a great quantity of wrought articles in gold and silver, as couches, tripods, basins, drinking vessels."

The doors, walls, and even the roofs of their houses were reported to be inlaid with "ivory, gold, silver, and precious stones."

From Gerrha's landward gates long caravans trailed off into Arabia, making for the

Araby's Sands Yield Clues to Ancient Man

The Persian Gulf region, haunt of Sindbad the Sailor, is famous for its petroleum pools, pearl fisheries, and mysterious sepulchral monuments. Digging into Bahrein Island's mounds, the archeologist-author identified the builders as the Dilmunites, long lost to history. Close to 'Oqair, he rediscovered antiquity's ruined city of Gerrha. Medieval Chinese coins proved an Arabian commercial link with the Far East.

Hadhramaut, the Red Sea ports, or the Mediterranean.

But long before the Middle Ages, Gerrha had dwindled and sunk into obscurity. By the 19th century its very location was uncertain.

Some scholars pointed out the similarity between the names Gerrha and 'Oqair, so this report of a big ruin-field in southern Hasa sounded promising.

"Like Small Bugs in a Sand Pile"

To reach 'Oqair we drove southward from Dhahran, passing through the mountainous dunes of the north Jafura Desert. Often these dunes are a hundred feet high, with a steep drop on the southern face.

One moment we might be climbing steadily; the next, our car's front wheels were at the brink of a void, with a sharp incline falling away to a pebbly surface far below. Then the car had to be backed, swung about, and taken off on a wide detour.

So our pickups, equipped with wide low-pressure tires, proceeded rather like small bugs in a sand pile—weaving back and forth, climbing, sliding, and changing course a hundred times (Plate VII and page 520).

We traveled by compass, finally turning eastward and coming out of the dunes close to where 'Oqair's clustered buildings overlook the deep-blue waters of the Gulf.

Just northwest of the harbor lay a vast ruin-field, littered with potsherds and pieces of colored glass. Stone foundation walls twisted whitely through the debris, while here and there were a few piles of coral building bricks.

Here was indeed the sarcophagus of ancient Gerrha. But no buildings or inscriptions were visible and no pillars; nothing save acres of dreary rubble, over which a few gulls hovered and called shrilly.

Pliny, Rome's "human encyclopedia," wrote that Gerrha "measures five miles round and has towers made of squared blocks of salt."

Strabo, the Greek geographer, adds: "The soil contains salt and the people live in houses made of salt; and since flakes of salt continually scale off, owing to the scorching heat of the rays of the sun, the people frequently sprinkle their houses with water and thus keep the walls firm."

It is a fascinating picture—a great city built entirely from blocks of snow-white salt, the inhabitants running about with pails of water and dashing the contents onto sizzling walls.

The probable explanation is less romantic. No actual salt beds exist near by, but the flat *sabhka* areas are extensive. In this clayey soil the percentage of gypsum and crystalline salt is high, and bricks made from it would have been subject to strong chemical change.

So Strabo must really be referring to the effect of efflorescence on saline mud. It is easy to understand why in time this "salt city" crumbled away, leaving nothing above its stone foundations.

I found the country around 'Oqair barren, wind-swept, and all but waterless. About 205 B. C. a Seleucid monarch, King Antiochus III, sailed hither with a fleet, intending to reduce the city of Gerrha and the neighboring tribes. One look at this sterile region made him abandon all idea of a permanent occupation.

Early Search for Peace and Freedom

So when the Gerrhaean chief sent him this message: "Destroy not, O King, those two things which have been given us of the gods —perpetual peace and freedom," Antiochus settled for a large tribute in silver and precious stones, and then sailed away.

On our journey back to Dhahran we met only two Arabs, one coming out of nowhere at the head of three scrawny camels, the other with a falcon on his arm. He was perhaps hoping to bag a desert hare—pale-colored and very small.

When done in the grand manner, Arabian hawking is carried out by a party of mounted men, accompanied by lean salukis (greyhounds). Black slaves carry the birds, which are hooded with small leather helmets, often red or green and richly ornamented with gold and silver thread.

If a fleet gazelle is the quarry, the falcon will swoop down from on high, dig claws into its head, and fiercely peck at the terrified creature's eyes until it is blinded and can no longer escape the pursuing greyhounds.

But game is scarce along the Hasa littoral, and even the restless Bedouins seem to avoid this region. Geologists believe that many thousands of years ago Hasa was comparatively free of sand, that rainfall was much heavier, and that trees and lakes were common.

Dunes Move Before the *Shamal* Wind

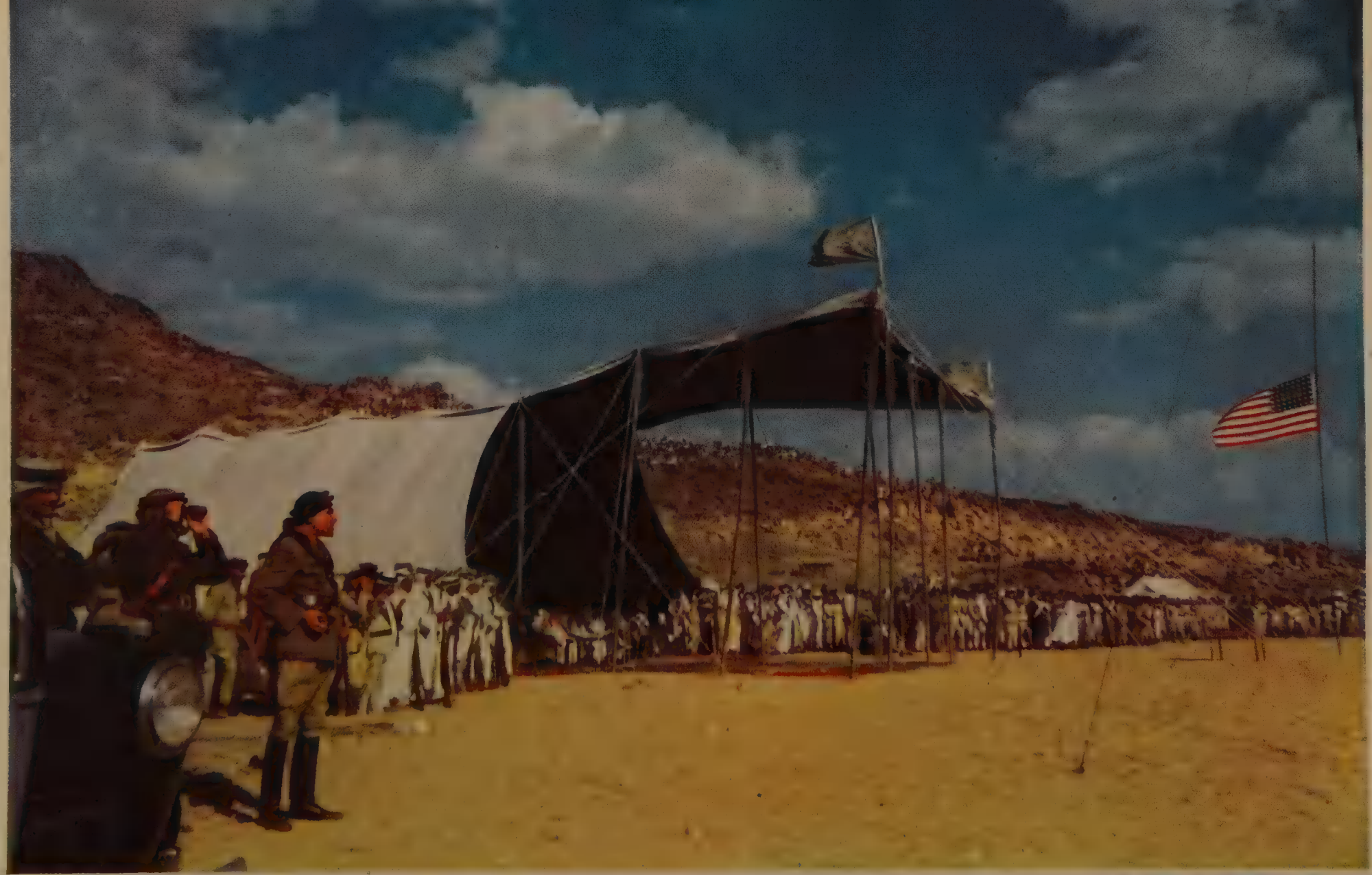
With a change of climate and of wind direction, Arabia began to dry up. Coming from the northwest, drifting dunes began rolling down into Hasa. They have never ceased to come, nor to encroach on the various oases.

Moving 40 to 50 feet a year under the impact of the *shamal* (northwesterly) wind, giant dunes have passed over many ancient towns and gardens. Near 'Oqair, for instance, where once stood a large date grove, there is

King Abdul Aziz al Saud, Architect of the New Saudi Arabia, Builds with Oil Millions
For every barrel of petroleum Americans pump from his desert sands, His Majesty receives 21 cents.

© National Geographic Society Kodachromes by Maynard Owen Williams

Side Arms and Cartridge Belts Complement Well-dressed Arabs' Gowns and Shawls
These desert stalwarts gathered at Taif, summer resort amid the barren hills behind Mecca, to witness graduation exercises of the Student Officers Training School.



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Kodachrome by Maynard Owen Williams

At Taif, Saudi Arabian Leaders and Guests Watch Student Soldiers Display Prowess with Lend-Lease Equipment

Exercises closing a 3-month training course during World War II coincided with Franklin D. Roosevelt's death; hence the half-masted flag. Officers (left) observe a marksmanship test.

© National Geographic Society

Kodachrome by Maynard Owen Williams

The Arab Headdress, Crowned with Coils of Goat Hair, Protects American Visitors from the Desert Sun

Col. Garrett B. Shomber, head of a World War II training mission, and Col. William A. Eddy, former United States envoy (in white suit, center), flank Prince Mansur, Minister of Defense, as they arrive for a military demonstration at Taif (Plates V and VIII).

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Kodachrome by Maynard Owen Williams

Though Tribal Warfare Belongs to Saudi Arabia's Past, Bedouins Like These Seldom Venture Forth Without Rifles

Under King Abdul Aziz al Saud's modernization program, many of his subjects have abandoned the role of nomad to till the soil in Government-sponsored agricultural communities. This group saw sons and brothers complete a wartime course in the use of American equipment.

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Kodachrome by Maynard Owen Williams

Under a Ceremonial "Big Top" at Taif, Diplomas Await Arabian Military Specialists Trained by Americans During the War

Prince Mansur, Minister of Defense, occupies a gilded thronelike chair behind the table. Karl S. Twitchell (standing, left), confidant of King Abdul Aziz, translates Arabic into English for American guests. Col. William A. Eddy (center), former U. S. Minister, wears Arab headdress.

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Kodachrome by Maynard Owen Williams

Ever Scarcer Become Camel Caravans as Saudi Arabia Rushes Forward on a Wave of Petroleum Wealth

Trucks and tractors, driven by American-trained ex-nomads, displace "ships of the desert" like these plodding across the Dahana dunes. Experts have recommended systematic breeding to produce camel hair for export

© National Geographic Society

Kodachrome by Maynard Owen Williams

An American Truck, Equipped with Special Oversize Tires, Goes Farther Between Drinks than Any Camel

A new kind of "footprint" on the sands symbolizes oil-rich Saudi Arabia's modern trend. This Diamond T "six-by-six" tackles the dunes between the American Agricultural Mission at Al Kharj and the Arabian American Oil Company's Ras-at-Tannura refinery.

© National Geographic Society Kodachrome by Maynard Owen Williams

An American Envoy and His Wife Put on Arab Dress and "Welcome" Smiles

Col. William A. Eddy, former United States Minister to Saudi Arabia, and Mrs. Eddy wear costumes presented by King Abdul Aziz al Saud. They stand in the doorway of the Legation at Jidda, formerly the home of a wealthy Syrian merchant. Colonel Eddy now is a consultant on Middle East economic affairs.

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Kodachrome by Maynard Owen Williams

Poisonous Gases, By-product of Oil Production, Vanish in a Tall Pillar of Flame

Such flares burn night and day near the Arabian American Oil Company's wells at Dhahran. They consume noxious material which, if allowed to spread unchecked, might cover the near-by refinery area. A friction spark or a truck's backfire could ignite the fumes and touch off a catastrophic blaze.

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Kodachrome by Maynard Owen Williams

Saudi Arabia's Modern Aladdin, Oil, Conjures Up a Giant Refinery on a Barren Persian Gulf Sandspit

This Arabian American Oil Company plant at Ras-at-Tannura, incomplete when photographed, now turns out about 115,000 barrels of fuel a day. Under construction is a 31-inch pipe line from the refinery to a Mediterranean outlet at Sidon, Lebanon.

© National Geographic Society

Clothes Make the Man in Saudi Arabia, Too

The shopkeeper (standing) wears skullcap, gown, and wide trousers. His visitor favors a head shawl, goat-hair crown, and gold-embroidered *aba*.

Kodachromes by Maynard Owen Williams

Oilmen Ride a Launch to Their Persian Gulf Outpost

Manned by Arabs, this craft plies between Al Khobar, on the Saudi Arabia mainland, and Manama, near another American concession on Bahrein Island.

© National Geographic Society

Kodachrome by Maynard Owen Williams

Blinding White Walls under a Deep-blue Sky Make Tall Jidda Seem a Spotless Town

Though gates sag at the hinges, smoke-blackened oil tins replace graceful pottery, and packing cases serve as fruit stands, this city on the Red Sea still holds glamour. As gateway to Mecca, Jidda annually attracts Moslem pilgrims from Asia, Africa, Indonesia, and the Philippines.

Whitewashed Stairway and Gleaming Minaret Form Cubistic Patterns under the Sky of Jidda

© National Geographic Society

Kodachromes by Maynard Owen Williams

An Arab Policeman, Honoring a King's Guest, Lets a Camera Look into a Woman's Eye

In Hofuf's market place her red yarn attracted the photographer. Moslem law decrees that women live in obscurity, but this one volunteered to pose. She was supported by the officer and crowd.

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Kodachrome by Maynard Owen Williams

On a Palace Roof at Al Kharj, an Arizona Dirt Farmer Holds a Conference on Saudi Arabian Land Problems

David Rogers (second from right) headed an American agricultural mission seeking to provide fertile fields where nomads could settle down and raise food for their

© National Geographic Society

Kodachrome by Maynard Owen Williams

Bodyguards and Retainers Surround Yusuf Yasin, Acting Foreign Minister and Right-hand Man to Arabia's King

Western-style tunics and breeches (center and extreme right) contrast with traditional *aba* (gown) and *kaffiyeh* (headdress) worn by others of the King's retinue. Two men (left) wear ceremonial daggers and carry richly carved swords.

Near Dhahran, Flowering Onions Recall Wartime Days when Food Was Scarce

American refinery workers planted these and other vegetables when the Axis menaced the Persian Gulf approaches. They were allowed to go to seed when shipping was resumed.

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Kodachromes by Maynard Owen Williams

A Desert Dairy near Al Khobar Provides Milk for Oilmen Far from Home

Output of these cattle was vital to Americans in Saudi Arabia when Rommel was at El 'Alamein. Now there is plenty of condensed milk from the States, but the cows remain on the oil company's pay roll.

now only a sea of sand, above which some stunted palm trees poke their shriveled heads.

Not to have found any inscriptions or other good relics in Gerrha was a big disappointment.

To make matters worse, I woke up at Dhahran next morning to find myself locally infamous. The oil company's manager asked to see me, and when we met he asked in a worried tone, "Where is that elephant?"

"Elephant?" I repeated.

"Yes, the big elephant you found at 'Oqair."

My Arab companions, it developed, had disliked having no "news" for their friends. So they reported that I had found an immense stone elephant at 'Oqair which had been hauled away by our cars, to be crated and sent off to a distant land.

In the excitement the elephant grew ever greater, and with it indignation that such a national treasure should be removed from Saudi Arabia!

I weathered the storm, but have often regretted that in this particular case smoke was unaccompanied by any spark of fire.

The most interesting locality in all Hasa is that around Dhahran, the oil company's principal base. Here is a great bowllike rim-rock structure, and the outer slopes of this depression are sprinkled with thousands of the same sort of Bronze Age burial mounds as those on Bahrein Island.

Some of the mounds at Dhahran are encircled by a low rampart of gravel, presumably to prevent too close building of other mounds. One mound has a peculiar "avenue" leading from it—two parallel walls 60 feet in length, facing due north.

In places these conical tombs cluster in such profusion that they resemble a cemetery-city or a settlement of gigantic prairie dogs.

In Bahrein, as well as Hasa, the smaller mounds cover a stone cist; the larger ones contain at least one tomb chamber, made of stone blocks and occasionally plastered. Where there is a doorway, it faces southwest, W. 25° S. being the most frequent reading.

What can be the reason for this orientation? Did the mound builders come from that direction?

A possibility is that, when one of these tombs was constructed, its entrance was oriented toward the evening star. For astronomers calculate that the range in azimuth of the tomb entrances corresponds fairly well with that of Venus at sunset. And we have plenty of evidence that the worship of a mother-goddess, often identified with the planet Venus, is immeasurably old in this part of the world.

It was only after months of excavation, plus years of research, that I established the identity of the people buried within these Bronze Age mounds.

They were known as the Dilmunites; their king ruled over both Hasa and Bahrein Island. For at least 2,000 years, from 2,500 to 500 B. C., they fought and traded with Sumerians, Assyrians, and many others.

The Dilmunites never attained the high level of culture reached by the kingdoms of Mesopotamia. Except for one cuneiform inscription found on Bahrein, all our written sources for Dilmun come from the Babylonians and Assyrians.

These records, inscribed in wedge-shaped script on clay tablets or on stone, tell that Dilmun was a "holy land" to the Sumerians. To the island of Dilmun (Bahrein), Ziusudra, the Babylonian Noah, went to live after the Great Flood.

To this land, too, the demigod Gilgamesh journeyed to learn the secret of life from the wise Ziusudra, he who had been given eternal life "like unto the gods."

Dates Exported in Early Times

Other tablets actually suggest that Dilmun was an earlier home of the talented Sumerians, where they may have dwelt for a time before settling in the valleys of the Tigris and Euphrates.

Detective work among crumbling clay records has produced much other information about this very early Arabian kingdom.

For example, the chief export of the country was dates. They were evidently as highly esteemed as the amber-colored, semitransparent fruit of modern Hasa, which is shipped to all parts of the Arab world.

We learn, too, that the special deities of Dilmun were the god Inzak and his consort Lakhamun; that about 2360 B. C. the famous Sargon of Akkad, having conquered Dilmun, carried away its ships as spoils; and also that even earlier the princes of Lagash sent southward to the Dilmunites such useful articles as wheat, cedarwood, cheese, and shelled barley—all sent in exchange for copper ore, which the venturesome sailors of Dilmun got from the country we call Oman.

During Assyrian times the kingdom of Dilmun became the object of a Hitlerlike "pressure-campaign," for the Assyrians were determined to make the country tributary to their empire. So in 689 B. C., when Sennacherib destroyed Babylon, he cunningly sent to Dilmun some of the brown dust that had been this far-famed city.

Evidently the "present" had considerable

effect, for Assyrian records proclaim: "The Dilmunites looked upon it (the dust), and the terror of the fear of Ashur fell upon them and they brought their treasures. With their treasures they sent artisans, mustered from their land, carriers of the head pad, a copper chariot, copper tools, vessels of the workmanship of their land. . . ."

In the reign of Sennacherib's grandson, the luxurious and cultured Ashurbanipal (the Asnapper of Ezra 4:10), Dilmun is mentioned in a list of Assyria's provinces.

So it seems that eventually the Dilmunites had to yield to Assyria and "take the oath of allegiance by the great gods."

In the early Bahrein mounds, most of which probably date from the second millennium B. C., I found human skeletons, pottery, bronze weapons and tools, as well as ostrich-egg shells and parts of ivory boxes.

Many tomb chambers also contained the bones of a ram or sheep, evidence of a blood sacrifice—a custom that Islam has never entirely uprooted in this region. Even today the figureheads of Bahrein boats are sometimes covered with the skin of a sheep or ram.

Home of Early Pirates

Where the Dilmunites originally came from remains a mystery. Yet there are reasons for believing that they drifted up from southwestern Arabia.

In their new home they must have taken rapidly to trade—and piracy. For at that time (perhaps not long after 3000 B. C.) there already sailed past this coast ships engaged in commerce between Mesopotamia and lands lying to the south: India, Oman, south Arabia, and places whose identity is still in doubt.

During navigation's infancy it was the custom to hug a shore line. The Iranian coast of the Gulf is so much more inhospitable than the Arabian one that even modern steamers prefer keeping near the western shore.

So the Dilmunite kingdom lay athwart the earliest sea-trading route of which we have any certain knowledge.

The goods carried northward included goats and copper ore from Oman, frankincense and myrrh from south Arabia, teakwood from India; also linen, diorite for statues, ivory, precious stones, and no doubt, "apes and peacocks."

Soon after my arrival at Dhahran, an American engineer told me that at Duwadami, in the very heart of Arabia, a "large arrowhead" had been dug up during construction of water tanks.

When he brought it forth, I recognized that he had made an exciting discovery, for it was a finely shaped hand ax of the Lower Paleolithic period (page 518). This weapon had been fashioned and used by some Acheulean man perhaps a hundred thousand years before Christ!

Link Between Africa and Palestine

It was a hint of the archeological treasures that must lie concealed in the center of Arabia, territory still completely unknown to prehistorians. For Arabia was a link between Africa and Palestine.

Before leaving for the Middle East I examined many aerial photographs of the Dhahran area with a magnifying glass. One place especially struck me as being a likely spot for finding traces of Stone Age man.

This was Jabal al Mudra, known as the "Shield of the North." This hill, whose summit is 410 feet above sea level, has a wide rock "bench" or terrace about a third of the way up. I suspected that its commanding position would have made it a natural port of call for early hunters.

Therefore, it was with a feeling of anticipation that I first climbed up to examine the rock bench. Here and there on its flat surface were small burial mounds; but what drew my instant attention were many bright flints lying on the ground between them. Recent rains had washed them clean.

I spent several days collecting flints and packing them away in small canvas sacks. They included scrapers, points, cores, and rejects, of various interesting techniques.

Some of these tools probably were made by the earliest mound builders; others seem to have been fashioned by true Stone Age men, but men far nearer to us in time than were the primitive Acheuleans who must have roamed central Arabia.

While I was gathering these artifacts, two young Bedouin brothers appeared out of nowhere. For a long while they watched me, much puzzled as to why anyone should stoop, pick up a small stone, study it, and then place it in a bag.

Presently one of the boys knelt and selected a flint, which he offered me. But as it showed no working by man, I shook my head.

He kept gathering stones and offering them, until at last I took one, a true artifact, and put it in a bag. At that both boys broke into wild giggles and exclaimed, "Mashallah!" (As God wills!).

Pearling Camps of Ancient Days

They evidently thought it a fine guessing game: to see which stones the mad stranger would accept, and which he would refuse.

In this central district of Hasa I found many other things worthy of study. Near the coastline, east of the tumuli fields, are huge, elongated shell heaps, one over a hundred yards in length. The type of shell proves that near by were old pearling camps.

We know from medieval geographers that along this shore pearl diving was a chief industry. It is the same today. Bahrein is known far and wide for the excellence of its pearls.

How ancient is the exploitation of the pearl oyster we cannot say, but it dates at least from the time of Alexander the Great (356-323 B. C.).

Over 300 years later Pliny declared that in his day Bahrein was "famous for the vast number of its pearls."

A cuneiform tablet found at Ur mentions a parcel of "fish eyes" brought from Dilmun. If this refers to pearls, then the pearl oyster was very early sought for, and its gleaming jewel used, perhaps to set off the dark-brown skin of Sumerian beauties.

Peter Bruce Cornwall

Who Built Bahrein's Nine-seat "Council Chamber"?

Just below street level in Manama the author uncovered this circular monument to Bahrein Island's "forgotten men." That Arabs did not build it he deduced by the shape. The mystic number nine, venerated by the ancients, suggests it was erected in Greek or Roman days. Next to a metal rod, used as a probe, sits a young Bahreini (page 493).

North of the shell heaps, and about two miles inland, I came upon a fossil dune called Muraikibat by the Arabs. Like a petrified tree it lies there, a finely preserved mummy of the late Pleistocene, when Europe still shivered in the Glacial period.

The "Tower of Silence"

This fossil dune is more than a mere curiosity, though: it provides valuable information to geologists and other students of Arabia's remote past. For whereas today the drifting dunes of Hasa move towards the south-southeast, Muraikibat faces the southwest.

So when this dune was solidified, the winds were coming from the northeast, which means that then climatic conditions were radically different throughout Arabia.

On the sloping southwestern face of Muraikibat I found more than a score of curious pits. Some are about two feet by one foot, and eight inches deep; others resemble small coffins in size. Possibly Muraikibat once served as a *dakhma,* or "tower of silence."

Many followers of Zoroaster's creed from Iran dwelt hereabouts in the early centuries of our era. They may have exposed their dead in these lonely pits, leaving them to be devoured by vultures and wild dogs. Such was the custom of these folk, a custom

Harold Corsini from Standard Oil Co.

The King's Thirsty Camels Arch Long Necks and Fill Reserve Stomach Tanks

Before the oilmen came with mechanical rigs, the Bedouins depended on hand-dug wells. Now one caravan route which formerly watered 75 camels a day is able to support 5,000. This well near Al Jauf was dug to supply water for a drilling operation. As soon as oil was brought in, the water rights were turned over to King Abdul Aziz al Saud (page 492). Going where trucks cannot operate, the camel feeds freight to Arabia's new motor roads.

maintained today in India by their Parsee descendants.

Driving to the shore line two miles north of Muraikibat, I next visited the little town of Dammam, notable for a stone castle that perches on a coral reef offshore and is surrounded by water at high tide.

This fortress, in whose courtyard a few long cannon lie rusting, is believed to have been built by the Portuguese, who came to the Persian Gulf in the early years of the 16th century.

Wresting out of Moslem hands control of the lucrative trade routes, the Portuguese founded the first modern European empire to be established in Asia. The massive castles they erected in the Gulf provide mute witness to their short-lived power, which crumbled before the attacks of rebellious Arabs and Iranians, and then was swept away by a combination of Dutch and English sea power.

The "Most Successful" Pirate

During more than a score of years at the beginning of the 19th century, Rahma bin Jabir, "perhaps the most successful pirate

that ever infested any sea," made Dammam his lair.

While Rahma's ruling motive was fierce enmity towards the sheiks of Bahrein, he overlooked no likely prize. With five or six large vessels, each manned by two or three hundred lean rascals, he sallied forth to capture vessels from Kuwait, Basra, Muscat, and other ports.

A European who saw this pirate tells us that his figure "presented a meager trunk, with four lank members, all of them cut and hacked and pierced with wounds of sabers, spears, and bullets in every part."

In the last encounter at close quarters between his vessel and that of an opponent, Rahma, seeing that his men were losing, blew up the ship with his own hand and perished along with all his companions.

The principal seacoast town of Hasa is Qatif, which stands some 10 miles northwest of Dammam. I found ample evidence that ever since the Bronze Age the area lying between these two places has been the most thickly populated along the entire littoral.

The debris of centuries is mixed haphazardly, and I picked up many a piece of medieval pottery, as well as Chinese coins dating from the reigns of the Emperors Che Tsung (A.D. 1085-1100) and Li Tsung (A.D. 1224-64).

As early as the tenth century unwieldy Chinese junks appeared in these waters to exchange products of their distant land for pearls, dates, aromatics, and other commodities. At one time Chinese copper money became current in some ports of the Gulf.

Near Qatif I also found examples of the *tawila,* or "long bit," a piece of copper having a small amount of nickel in it. The tawila is shaped like a V, but with one prong straight and the other slightly curved at the tip. Although minted by one of the Carmathian princes, over 100 years before William the Conqueror set foot in England, it is still accepted in the shops of Hofuf, Hasa's capital!

Just west of Qatif's date-palm gardens stands a long line of wells. The water in them, artesian and warm (84° F.), flows eastward in subterranean channels, from which cylindrical shafts rise at intervals.

As the drifting dunes encroached on this area, the men of Qatif kept building up the shafts higher and higher (page 521). But now the sand has shifted or passed on, leaving some masonry columns towering nakedly in the air, like tall chimneys.

According to local tradition, which scientific study confirms, these wells once stood in the center of an immense tract of date palms. The Arabs also claim that the irrigation system was set up "long before the time of Islam." Since it is Iranian in style, the builder may well have been one of a series of Sassanian monarchs who once ruled over this Province.

About A. D. 320 Shapur II, the first of them, brought an army across from Iran and conquered Hasa. He put to the sword many of its people, all but exterminating the leading tribes.

When tired of killing, this butcher ordered his troops to pierce the shoulders of the vanquished, tie them with ropes, and bring them in as prisoners. Because of this piece of cruelty, Shapur is known in Oriental history as *Dhu'l Aqtaf,* "Man of the Shoulders."

Since a few of the Qatif wells are as much as 160 feet in depth, American geologists are puzzled as to how they could have been constructed. For when the well shaft approached the porous Eocene strata, there must have been rapid seepage into the hole.

Fresh Water from Beneath the Sea

Inasmuch as the water flow is now several thousand barrels a day, it is considered amazing that the original diggers, with their crude equipment, managed to open up the porous formation to that extent. As usual, Arabs have a simple explanation: "Falling stars knocked holes in the ground, and Allah cupped them up!"

Like Hasa, Bahrein Island has numerous wells, the most remarkable being submarine springs that exist just offshore. Fresh water courses up from beneath the sea in such abundance that the islanders may wade out and fill their jars with pure drinking water.

This wealth of fresh water in Hasa, a supply unparalleled in other parts of Arabia, is often commented on by ancient writers. It seems always to have been regarded reverently as a special gift of the gods.

The source of this water supply remained an enigma until very recently. It was even imagined by Arabs that a hole existed in the bottom of the Euphrates River, whence the water ran underground all the way to Hasa.

We know now that the source is in the Tuwaiq Mountains (Jabal-at-Tuwaiq), some 250 miles to the west of Qatif. Thence underground rivers flow into Hasa.

Somewhere amid the ruins spread around Qatif may be the remains of Bilbana, a city located here by the geographer Ptolemy. And Pliny tells us that on Qatif bay, which he called Capeus, lived two tribes known as the Gaulopes and Chateni. Qatif is thought to preserve the name of the latter tribe.

What these Gaulopes and Chateni were like,

Gasberg Photo Studio

Arabia's Skull Cracker of 100,000 B. C.

An American oilman gave this Stone Age hand ax to the author under the impression that it was a "large arrowhead." Chipped from a volcanic rock, it is seven inches long. Workmen digging a water tank discovered the ax in central Arabia (page 514).

we can only guess. But judging from what later writers say, they must have dabbled in piracy. So plagued by sea robbers were the Eastern trade routes at that period that a "cohort of archers" was regularly placed on board each ship.

Throughout the centuries, in fact, piracy remained a flourishing profession in the Gulf. It was not stamped out until early in the last century, when British men-of-war systematically hunted down the pirate bands, in one instance landing thousands of troops to storm a town swarming with freebooters.

Qatif city, which I visited next, was once a place of importance. Here the Portuguese built a fort soon after 1550, in which year they captured the settlement and routed a mixed army of Arabs and Turks.

Captive Birds Are Children's Pets

The fort remains, but the city is unattractive and shabby. Along the streets trot sturdy white donkeys, carrying people, baskets of dates, fagots, and every manner of article. In the time of the Portuguese they were considered "the finest asses in the world," and even today one finds them as far off as the center of Tanganyika Territory in East Africa, whither they were transported via Zanzibar and Dar es Salaam.

Whenever I entered Qatif I was surrounded by swarms of inquisitive children, many of them pockmarked. Not infrequently they carried pet birds, secured by a string around one fragile leg.

As in most Gulfside ports, the population is heterogeneous, including many folk of Iranian or Iraqi descent. And in the early centuries of our era, Nestorian Christians as well as Jews were numerous hereabouts.

Qatif's men have little initiative, are somewhat small in stature, and seldom possess clean-cut features. But in the oil company's employ at Dhahran and Ras-at-Tannura are many robust, fine-looking Arabs from Hofuf and the interior Province of Nejd. These men are capable, dignified, and surprisingly quick at learning new ways.

No one who comes to know them fails to realize that, given proper education and opportunities, young Saudi Arabians have it in them to form the backbone of a new and progressive Arabian nation.

While exploring the Qatif area I heard rumors of a stone statue and inscribed tablet.

They were said to have been reburied in a date garden.

Having obtained the local sheik's permission to dig for them, I set out one afternoon with a gang of diggers and assorted tools.

The sheik, small and bearded, joined our party. He tried to remember just where the objects had been hidden. He walked up and down between the tall date palms, studying the smooth sand and pondering. Finally he faced me, flung wide his arms, and announced, "Tawakkul 'al' Allah!" (Rely on God!).

He could not remember. The relics lay somewhere within a 50-yard radius, he thought. That was all he could say.

Anxiously I set my men to probing the sand roundabout with long metal surveying rods. But the shadows of late afternoon lengthened, and still our luck was bad. On an impulse I finally seized one of the metal rods, took a few paces at random, then plunged the shaft deep into clinging sand. At two feet it struck stone.

Stone Tablet Shows Early Spread of Christianity

With cries of "Mashallah! Mashallah!" my men hurried forward and commenced shoveling. Soon we had both buried objects above ground and standing upright (page 522).

The stone tablet contained a Sabaean epitaph: "Tombstone and grave of Eliya the son of 'Yny the son of Shasar of the family of SMM of the clan of D'L of the tribe of Shawdhab. 30."

The most interesting point about this inscription, which dates from the fifth or sixth century after Christ, is that the name Eliya (Elijah) suggests that the man was a Christian.

When Mohammed began his teaching in the seventh century of our era, Christianity had reached into many corners of Arabia.

The gospel was carried by missionaries out of Syria, Iran, and even Ethiopia. Wherever it bore fruit, Arabs abandoned their worship of the sun, moon, the planet Venus, or a host of other gods. There is a real possibility that if Mohammed had not been born, the Arabs would today be Christians.

Five Nestorian bishoprics had been established in Arabia by the seventh century, and one of them seems to have included Qatif. I saw a stone, found here some years ago, bearing a carved cross of seventh-century style.

The statue which we dug up is three feet in height. Both head and shoulders are lacking, probably having been knocked off by Wahabi "idol smashers," for a graven image has ever been taboo among strict Mohammedans.

The figure is thought to represent a pagan priest, assisted by a boy, performing a sacrifice. Its date must be around A. D. 200.

According to our friend the sheik, this statue was unearthed originally on Tarut, an island in Qatif bay. Arabs have found on Tarut statuettes of similar form, and also golden coins.

My next step was to pay a visit to Tarut Island, which on the Arabian map of Claudius Ptolemy, the Greco-Egyptian geographer who flourished under Hadrian, was labeled Tharo.

Two days before Christmas, accompanied by a geologist and several Arabs, I set out from Al Khobar in a native coastal boat and headed north for the island.

The *shamal,* or prevailing northwester, was blowing briskly, and the sky had grown overcast. So there was some danger of being caught by a storm. At times this shamal attains a velocity of more than 60 miles per hour, bringing with it great quantities of dust and sand out of the Nafud.

Even worse, in the view of navigators, is the unhealthy southeaster, or *qaus,* which is accompanied generally by rain and violent squalls. We know it has always been feared, for in the ruins of "Ur of the Chaldees" diggers have found a charm against "the evil of the South Wind."

The Scene of Sindbad's Voyages

As we approached the island, Tarut recalled scenes from the voyages of Sindbad the Sailor, for the steep walls of Darin, its principal town, cover most of the southern side and so give the impression of a city rising abruptly from the sea.

Tarut exudes an indefinable atmosphere of romance and mystery. This is true of nearly all the islands in the Gulf, and is notably reflected in the account of Sindbad's adventures.

On Tarut I could find no trace of an early temple, nor of any likely looking ruins. But the houses of present-day Darin apparently rest on the remains of earlier buildings.

Just north of the town is one place worth archeological attention: a field of small, crude, irregular mounds, which the natives say is an old burial place. Only excavation could lay bare its secrets.

In the Middle Ages this island grew famous for its stocks of musk and spices, imported from the south.

The modern islanders seem to subsist largely on fish, which from time immemorial has been the staple food of all peoples dwelling

Standard Oil Co.

Crescent-shaped Dunes in a Sea of Sand Arch Like Breakers: A View from 10,000 Feet

Arabia's prevailing wind, the *shamal,* approaches the convex side and sweeps sand up over the crest, where gravity deposits it at the angle of repose, 20 to 40 degrees. In such fashion the dunes creep 50 feet a year, and some grow 100 feet high. Storms blow the sand like snow in a blizzard. While hunting for Gerrha, one of antiquity's lost cities, the author drove across such dunes in a light truck. Enormous tires, inflated to only a few pounds' pressure, make desert travel possible (page 496).

here along the coast of the Persian Gulf.

One of Alexander the Great's admirals, while exploring the sea route from India to the Euphrates, came upon some men who "had shaggy hair all over their body; their nails resembled the claws of wild beasts, and were used, it would seem, for dividing fish and splitting the softer kinds of wood." For clothing they occasionally wore "the thick skins of the large sorts of fish."

Island of the "Fisheaters"

Sumerian priests, as seal impressions reveal, dressed at times in the guise of a great fish.

Alexander's sailors also visited a folk called Ichthyophagi (Fisheaters), whose diet consisted entirely of fish, which they caught by setting nets and waiting for the ebbing tide to leave a catch. At Dammam town I saw inshore nets of much the same pattern as those reported made by these "Fisheaters."

Soon after returning from Tarut I set out for the northern quarter of Hasa, passing on the way shambling camel caravans bound for various oases in the northwest (Plate VI).

The land was barren, almost treeless, with very little of interest. But seven miles south of Jubail al Bahri, a small port, I found a queer, deserted town on the top of Jabal Bahri.

On the hilltop stand the ruins of oblong stone houses separated by streets, the whole laid out in orderly pattern. No wells exist in the hill or at its foot, nor are any reservoirs visible. Yet somehow its inhabitants must have provided themselves with water.

The place is strong defensively and may have withstood many a sudden attack by mounted raiders from the desert. Potsherds of green or blue glaze indicate that this hill town, whose name has long been forgotten, belonged to the Middle Ages.

From time to time I had heard talk of old cliff castles about 85 miles west of Jubail. With the usual pair of trucks I now set out in search of these promising ruins.

Our route westward ran through rolling

Peter Bruce Cornwall

Ghost Wells, Long Necks Exposed by Wind Erosion, Mark the Grave of an Oasis near Qatif

Once the distant palm grove extended into this empty space. Then, as dunes encroached, wells were built ever higher. Receding, the sand wave left the columns high and idle. They mark the course of an underground river rising 250 miles away. Qatif's irrigation system dates possibly from the Iranian conquest, some 1,600 years ago (page 517).

country, so the journey was much like riding in a small motor launch over a seemingly endless series of waves.

An Early Caravan City

We stopped to refuel at Hinnat, one of the very few villages in this desolate region. Here and at the ruin-field of Thaj, about five miles southwest, an earlier visitor, Capt. W. H. I. Shakespear, discovered in 1911 three interesting Sabaean inscriptions.

Shakespear, then British Political Agent at Kuwait, made a number of excursions into the interior, until in 1915 he was killed in a tribal skirmish on the borders of Nejd.

The place known as Thaj lay on the important caravan route running down from the kingdom of Hira, in Mesopotamia, to Najran in south Arabia. In both places Christians were numerous; so many an early missionary must have stopped at Thaj while traveling through the peninsula.

From Hinnat we continued westward, entering the great interior Province of Nejd, "heartland of the Arabs." Brown flat plains stretched away to the far horizon, and here and there mesas gave a touch of grandeur to the landscape, recalling the Apache country of the American Southwest.

First of the Cliff Castles

After passing through a series of low enclosed basins called the Wadi al Miyah, we came to the easternmost escarpment and there spied the first cliff castle.

It was a fairly small settlement perched on top of an isolated butte. The mud-mortared stone walls enclosing it were built flush with the cliffside; it must have proved a tight and secure fortress.

At one point a little limestone platform jutted out. In its center was a round porthole through which only one man at a time could ascend, by means of a rope. In the rock floor of the settlement a very deep well had been dug.

Long abandoned, this cliff castle may be a relic of the turbulent ninth century, when

Peter Bruce Cornwall

Tombstone of an Elijah, Found in a Qatif Orchard, Suggests a Christian Burial

Some 1,700 years old, the tablet is inscribed in Sabaean, a Phoenicianlike alphabet, used in ancient Saba (the modern Yemen, the Biblical Sheba), whose queen visited King Solomon. On the right, a mutilated figure is thought to represent a heathen priest. Islam's spread in the seventh century replaced both paganism and Christianity along the Persian Gulf (page 519).

Carmathian fanatics ranged and fought in eastern Arabia.

Sworn enemies of the caliphs, and possessed of a prophet of their own, the Carmathians gained control of numerous towns and strongholds on this side of Arabia. Once, too, they actually raided Mecca and carried off Islam's sacred Black Stone, keeping it in Hasa for a score of years.

After leaving this cliff castle, we camped at a place some 24 miles east of Qariya es Sifla. During the evening there shuffled into the tent an aged Arab, reputed to be one of the best and most trustworthy guides in the peninsula, a man who "knew Arabia from the Rub' al Khali to the Wadi Sirhan."

By lamplight we discussed the topography of the northeast, and I asked particularly whether any caves or notable ruins were known to him. But he assured me that the cliff castles were all that mattered.

I could not help thinking, though, that during his wanderings in the interior this man must have passed by many sites which some day will reveal a story to archeologists, and that his feet may have kicked aside flint artifacts discarded by primitive men whose very existence he has never suspected.

Inner Arabia may hold much for the paleontologist also. In Pliocene strata, 90 miles west of Dammam Dome, oil geologists have discovered some teeth and leg bones from a primitive form of mastodon, together with a jaw fragment of an early antelope. These fossils are perhaps 25,000,000 years old.

Gulf a Fiery Furnace in Summer

On the following day I explored two more cliff castles. They turned out to be much like the first one, and around all these settlements were scattered flint bird arrowheads, together with quantities of potsherds.

Our route now led back to headquarters at Dhahran, and a few weeks later I returned by motor launch to Bahrein Island. For spring was already near, and there was much further excavating to be done on Bahrein before increasing heat turned the Gulf into a fiery furnace.

During the four summer months temperatures range as high as 130 degrees in the shade. If workmen lay down their metal tools, they must bury them deep in the sand; otherwise they become too hot to handle.

So with many regrets I left Hasa and its diverse antiquities, hoping it was "au revoir" only, not farewell. But as the Arabs express it, "Allahu 'Alim" (God is the Knower).

The Idyllic Vale of Kashmir

By Volkmar Wentzel

With Illustrations from Photographs by the Author

LABORING hard, our onetime Army ambulance reached the top of 9,000-foot Banihal Pass, raced through a tunnel, made a sharp turn, and suddenly before us spread a sight that made the pulses leap—the emerald Vale of Kashmir, in the lap of the snowy Himalayas.*

Veining the valley were poplar-bordered roads and silvery willow-lined watercourses. Above this vision reared the ermine peaks of the mightiest mountain range on earth—cool, aloof, immaculate contrast to the flies, dust, and sweltering heat of the Indian plain behind us.

Strife in Fertile Vale

Such was my first view of the Vale of Kashmir, in August, 1946. Fourteen months later this "Happy Valley" was to be racked by strife. Airborne Sikhs and Spitfire fighting planes of the Hindu-ruled Dominion of India were helping Kashmiri forces check advancing tribesmen from the Moslem Dominion of Pakistan (page 525).

Kashmir's fatal beauty and fertility had caused a tragic triangle, with the two new Dominions which had fallen heir to the British Empire of India contending for her favor.†

But peace reigned in the Vale of Kashmir when it burst upon our view with somewhat the breath-taking impact of an ice-cold shower bath.

Up from Delhi‡ we had come, my Hindu aide Ram Rau and I.

In the ex-ambulance which I had converted into a National Geographic Society survey car, we had followed the old route of the Moguls from India's ancient capital to their summer pleasure land (Plate I).

Those rulers had traveled in sumptuous style. On a leisurely trip from Delhi to Kashmir in 1664-65, the entourage of the Mogul Aurangzeb contained more than 300,000 people, and its transport consisted of at least 200,000 horses, mules, camels, oxen, and elephants.

In the mountains which rim the Vale of Kashmir there occurred a tremendous traffic accident as the Mogul's moving city made its elephantine way. Fifteen elephants fell over a cliff when unable to advance or turn around on the narrow road.

In contrast, our only misfortune was a flat tire caused by an abandoned oxshoe which had been worn to razor sharpness. Over good roads we easily made the 600-mile trip from Delhi to Kashmir in three days rather than the several months consumed by Aurangzeb, who often stopped to hunt and otherwise enjoy himself on the way.

Beef Barred from Kashmir

As we crossed the border from the Punjab into Kashmir, turbaned customs officials stopped us briefly. Bringing in beef is prohibited, since the Hindu religion forbids the killing of cows. (The Maharaja is a Hindu, though most of his people are Moslems.) Even canned goods must be checked lest they contain a trace of the forbidden flesh.

All the way from Delhi the oppressive heat of India in the monsoon season had lain upon us like a smothering blanket, but as we climbed into the mountains of Kashmir it seemed as if a heavy load had been lifted from the soul.

Even the car seemed to take on new life as, climbing through ever cooler air, we passed the temple spires of Jammu, the Maharaja's winter capital (map, page 526).

In this old city on the bank of the Tawi River, an electric power station, a silk factory, and the Prince of Wales College contrast with royal palaces of oriental splendor and with fort and museum buildings redolent of the past.

Where the first big glacial stream, the Chenab River, crossed the road, Ram and I stopped the car by common consent. Stripping, we luxuriated in the icy, tingling water.

From the river the road led upward in a series of horseshoe and hairpin turns to the summit of the Banihal Pass, 9,291 feet, dramatic gateway to the Vale of Kashmir.

On the crest we met our first typical Kashmiris—six men who had struggled up the steep

* See, in the National Geographic Magazine: "House-Boat Days in the Vale of Kashmir," by Florence H. Morden, October, 1929; "First Over the Roof of the World by Motor," by Maynard Owen Williams, March, 1932; "Outwitting the Water Demons of Kashmir," by Maurice Pratt Dunlap, November, 1921; "On the World's Highest Plateaus," by Hellmut de Terra, March, 1931.

† See "India—Yesterday, Today, and Tomorrow," by Lord Halifax, National Geographic Magazine, October, 1943.

‡ See, in the National Geographic Magazine: "New Delhi Goes Full Time," by Maynard Owen Williams, October, 1942; "India Mosaic," by Peter Muir and Frances Muir, April, 1946; "Delhi, Capital of a New Dominion," by Phillips Talbot, November, 1947.

slopes from the Vale and had stopped to rest before resuming their long, slow trek to market. On their backs they carried heavy loads of dried apricots and other produce.

Forked Stick Serves as Seat

Each man had a forked stick which served the purpose of the portable seat sometimes carried by golf fans in the United States. Placing the unforked end on the ground, the wayfarer half sits, half leans on the fork, as if reluctant to sprawl on the ground lest he find it too hard to get up again.

All six, evidently Moslems, wore the tight Kashmiri cap, a long shirtlike garment, short pants, and sandals. They had the somewhat Semitic features of the Kashmiri, with dark hair and dark, sad eyes. Their skin, though brown and weather-beaten, was lighter than that of the southern Indians, and I remembered what Dr. François Bernier, French traveler, had written nearly 300 years before:

"The women especially are very handsome; and it is from this country that nearly every individual, when first admitted to the court of the Great Mogul, selects wives or concubines, that his children may be whiter than the Indians and pass for genuine Moguls."

Much earlier, Marco Polo had paid the Kashmiri women a somewhat similar compliment. "The men," he wrote, "are brown and lean, but the women, taking them as brunettes, are very beautiful." *

Ram tried to talk with the men in Hindustani, but they seemed shy and soon resumed their toilsome trudge while we started down toward the carpet of green with its clusters of villages.

In a few minutes we were driving through a verdant countryside dotted with farmhouses and quaint little towns. In this Vale live about half of the State's 4,000,000 people, more than a mile above sea level.

Tradition Says Vale Was Once a Lake

Built largely of sun-baked brick, but with framework and trimming of wood, the houses were suggestive of Alpine chalets, an impression heightened by the snowy mountains beyond.

Wooden balconies hung from the house fronts like happy afterthoughts. The top story was usually left open for drying and storage. Roofs were thatched, and on many of them red peppers were drying. Ducks and geese waddled about the farmhouses and near the many streams.

Everywhere was running water, and I remembered the old Kashmiri legend that a great lake had once covered the Vale. The story goes that an aged saint miraculously split the mountain at Baramula, releasing the flood and transforming the lake into fertile, well-watered land.

At a good-sized town called Anantnag or Islamabad, depending upon whether you happen to be talking to a Hindu or a Moslem, we paused for a cup of tea, an amenity easily obtained in Kashmir because of the number of Englishmen who come there from the plains of India on holiday or retire to spend their remaining days in this heaven of the Himalayas.

The tea and biscuits served us at a sunny table under the chinar trees tasted as if they had come from an English inn instead of a Kashmiri kitchen with an oven of clay.

Refreshed, we followed the widening Jhelum down the valley to Srinagar, summer capital of the Maharaja and beloved pleasure place of generations of Moguls. Today the city has a population of about 200,000.

At a hotel with no plumbing but plenty of servants, who brought a tin bathtub and buckets of hot water, I slept gratefully under blankets for the first time since I landed in India many weeks before.

A Red-bearded Genie Materializes

Next morning there came a knock on my door, and a tall, elderly, bearded Mohammedan in turban, baggy trousers, and shoes with upturned toes stood before me like a genie conjured forth by a twist of an *Arabian Nights* wishing ring.

His beard was hennaed a rich shade of red, a sign of deep religious devotion among the followers of Islam. Distinctive turban and handsome eaglelike features proclaimed him a Pathan, or Afghan, a people renowned for courage and martial spirit.

Gravely and politely this apparition introduced himself as Nur Mohammed, veteran of expeditions to Nanga Parbat and other Himalayan peaks. From a European acquaintance in Srinagar he had heard of my coming and wished to be my servant and guide.

He turned out to be far more than that, including cook, philosopher, and friend, all for 100 rupees a month—little more than a dollar a day.

I had heard so much about difficulties between Hindus and Mohammedans in India that I half expected trouble when Nur Mohammed and Ram Rau met. But my fears soon proved ungrounded. Each treated the other's faith with respect as we visited Mo-

* See "World's Greatest Overland Explorer," by J. R. Hildebrand, National Geographic Magazine, November, 1928.

Max Desfor from Press Ass'n

Trenches Scar the "Happy Valley" as Indian Troops Defend Kashmir

Sikh soldiers dug in to guard the road between Baramula and Srinagar when tribesmen from Moslem Pakistan clashed with them last fall in the State of Jammu and Kashmir (map, page 526). Prompt arrival of troops by air from the Hindu-led Dominion of India blocked the way to Srinagar, the summer capital, and brought recapture of Baramula, at the entrance to the Vale.

hammedan mosque and Hindu temple alike in the course of our picturemaking.

We must have made a strange-looking trio—the tall, dignified, red-bearded Mohammedan, the slender, scholarly looking young Hindu who had majored in Sanskrit and usually had several books under his arm, and finally the American, in old Army trousers, checkered Kashmiri shirt, and tight-fitting red skullcap.

The Kashmiri cap was a master stroke. I bought it to keep my hair from blowing into my eyes, but it gave the Kashmiris no end of amusement, broke the ice, and made photography easy. Apparently they had never before seen a *sahib* wearing one of their caps.

Gondola with Inner-spring Mattress

To see a cross section of life in Srinagar, we boarded a *shikara* on the Jhelum River, which winds caressingly through the city as if reluctant to leave.

A characteristic institution of this Venice of India, the shikara, made of boards, is both a water-borne taxicab and a romantic pleasure boat akin to the Venetian gondola. Many have inner-spring mattresses upon which the indolent may recline, and such inducements are shouted to the world by the decidedly unbashful boatmen as they compete for patronage.

Coney Island, Honeymoon Springs, Good Fortune, Susy Q—nearly all the boats have names, like American bombing planes.* Many are designed to appeal to visitors from the United States, for numerous GIs came to Kashmir during the war and left their initials and chewing gum even on Himalayan mountaintops.

On a canopy-covered inner-spring mattress we glided smoothly down the Jhelum as the boatmen plied their paddles with curious heart-shaped blades (Plate IX).

The winding street of water was alive with colorful traffic. In one oversized shikara reclined a well-fed businessman smoking the Kashmiri equivalent of a large, luxurious cigar—an elaborate hookah, the hubble-bubble water pipe. In another, three or four Moslem girls were going to school.

Pretentious houseboats of the wealthy and

* See "Fun Helped Them Fight," by Stuart E. Jones, National Geographic Magazine, January, 1948.

Two New Dominions Clash over Kashmir, India's Northernmost State

Tribesmen from Moslem Pakistan (stripes) fought their way into the Minnesota-size State of Jammu and Kashmir last October. To get armed help, its Hindu Maharaja announced its "provisional" accession to the Hindu-ruled Dominion of India (dots), although the bulk of his people are Moslems. India's Prime Minister, Jawaharlal Nehru, a Kashmiri Hindu, sent immediate airborne aid, and sharp fighting followed. Later the case was laid before the United Nations Security Council. The lofty Himalayan State lies close to Russia and adjoins Sinkiang. Its heart is the fruitful Vale of Kashmir, along the Jhelum River between the mountains of Jammu and towering, lonely Gilgit and Ladakh.

the narrower, more graceful, but shabbier *dungas* on which native families live and die were moored along the shore or crawled like crabs from place to place under the patient urging of poles (Plates IV-V).

"All That Glitters Is Not Gold"

Along the banks women washed clothes, men unloaded wood or grain, and both sexes performed their ablutions.

From a balconied building overhanging the river came the monotonous drone of Mohammedan schoolboys learning the Koran by rote.

As we neared the heart of Srinagar's Old Town, a particularly conspicuous Hindu temple mirrored in the water caught my eye. Its gracefully tapering roof gleamed as if with gold.

Closer investigation showed that the temple had been roofed with tin from old kerosene cans. Rusting, these produced the golden glint.

In contrast, many of the Hindu temples which dot the Kashmir landscape have endured for centuries. In some, now ruined and abandoned, I noted traces of Greek architectural features, for ancient Greece began to make its arts and power felt in northern India in the time of Alexander the Great.*

* See "Greece—the Birthplace of Science and Free Speech," by Richard Stillwell, NATIONAL GEOGRAPHIC MAGAZINE, March, 1944, and "Afghanistan Makes Haste Slowly," by Maynard Owen Williams, December, 1933.

Unlike the Hindu temples, the Mohammedan mosques which punctured the skyline were made of wood. Strikingly different from the marble mosques of the Indian plain with their domes and minarets were these square block-house-type buildings of deodar logs. They bore little resemblance to any I had seen elsewhere in the Moslem world.

Wooden spires surmounted the sod roofs of the mosques, on which, as on many of the houses, sprouting grass gave the appearance of a man who needs a shave.

Above our heads on the seven bridges over the river passed an ever-changing parade. A couple of the bridges carried automobiles and *tongas*, two-wheeled horsecarts. But traffic on the others was mostly on foot—capped or turbaned men and veiled or unveiled women, many bearing burdens on their heads.

Most colorful were the Hindu women, their embroidered skirts bright with reds and greens. Many wore heavy earrings and necklaces, while the Mohammedan women often had anklets of silver. I concluded that the prettiest must always go veiled, because I had yet to see a real Kashmiri beauty.

A Gujar Crone Sits by the Roadside, Selling "Jewels"

In race and language the Gujars differ from the Kashmiris, with whom they rarely intermarry. Seasonal nomads, they follow their herds between alpine meadows and lowlands (page 547). In the mountains this woman picked up shiny quartz crystals, which she offers to every passing traveler.

Wholly different is the New Town, where Occidental influence is reflected. Two White Russians run a night-club houseboat called the *Bluebird*. On another houseboat is a beauty shop. Permanent European residents and visitors meet at the Srinagar Club amid surroundings reminiscent of a London club, and the little vine-covered Anglican church looks as if it had been taken right out of England, vines and all.

From the streets of the city one's eyes lift up to an age-old temple and a Pathan fort, each on its separate hill. These are the capital's twin landmarks—Shankar Acharya Temple and Hari Parbat Fort (Plate V).

Near the base of the temple hill, known to Moslems as Takht-i-Suleiman (Solomon's Throne), I visited the Church Missionary Society's hospital (English), founded more than 80 years ago. The land allotted for it was a Moslem burying ground—not only an inauspicious site for a hospital but also a physical handicap, since the buildings and walks had to be so placed as not to disturb the graves.

Here I heard native patients singing familiar old English hymns in Urdu. The courteous English doctor in charge invited me to tea, but as we sipped he had to excuse

himself to perform an emergency operation. The hospital ministers to hundreds of patients, many suffering from trachoma and other eye diseases.

Cheap John and Suffering Moses

Strange to Westerners are some of the names on the Kashmiri shops which line the Bund along the Jhelum in New Town. The proprietors seem to go out of their way to depreciate themselves. Subhana the Worst is the name of one. Another calls himself Cheap John, but whether the adjective refers to John or his products I could not determine. A floating shop on a near-by houseboat is run by a worthy named Suffering Moses!

In the first shop I entered I was greeted in English by the Kashmiri proprietor.

"The crepe rubber for this pair of shoes came from America," he said, "and we're sending our son to New York next year to open an export business in leather goods."

Both he and his son had learned English in the Kashmiri public schools.

I bought a pair of the native sandals, which are here particularly recommended for mountain climbing. But what, I wondered, keeps snow and cold from coming in at the open toes? The answer, it developed, is a pair of chamois socks.

In shop after shop I sought one of the famed Kashmir shawls of finest wool. My father bought a Paisley, an imitation of the Kashmir, long ago in an antique shop in New England—a thing of beauty, with reds, yellows, and greens glowing against a black background. But I soon discovered that one couldn't buy a genuine Kashmir shawl in its home country today for three times the price. Shawl weaving has virtually ceased.

One shop where I sought a shawl and found only a single torn, inferior specimen was also the place of business of a silversmith. As I entered, I saw him furtively hide some work he was doing. Later I saw what he had been making—"old" Grecian coins for sale to tourists!

Subhana the Worst, from my point of view, might better have been named Subhana the Best. When I looked over the beautifully decorated articles of papier-mâché in his shop and inquired where and how they were made, he took me to Old Town by shikara.

There I gained a good insight into the industries and handicrafts which keep so many Kashmiri hands busy and strain so many Kashmiri eyes. Never shall I walk on a Kashmiri rug again without feeling I am walking on somebody's eyesight.

Although Srinagar has electric light, I saw little sign of it in the rickety buildings I visited to photograph the typical Kashmiri handicrafts—wood carving, *pashmina* wool weaving, rug making, metalworking, and the production of intricately decorated articles of papier-mâché.

Openings which hardly could be called windows admitted a moderate amount of light in summer, but were covered with oiled paper at the approach of winter. Few of the places I saw had glass windowpanes. The result was a general semidarkness in which the artisans squinted over their exacting work (Plate VI).

Typical was a papier-mâché products "factory," really a down-at-the-heel private house. This was a family industry, and despite adverse conditions the workers, with cat-hair brushes, turned out beautifully painted napkin rings, trays, lamps, boxes, candlesticks, large screens, and elaborate urns (Plate XVI).

In considerably more pleasant surroundings, an airy balcony above the Jhelum, wood carvers were plying their chisels. All employees here were men and boys who learn the art from their elders.

Child labor appeared to be common, and some of the lads were obviously only nine or ten years old (page 550).

In a primitive building devoted to pashmina weaving, most of the workers were old men. One turbaned old-timer in horn-rimmed eyeglasses explained that it takes a lifetime to master the art (page 546).

Soft, beautifully woven scarves and other articles are made on small hand looms from the superfine pashmina wool. This comes from the under fleece of the belly of goats raised in lofty, cold, snowy Ladakh, sometimes known as "Little Tibet" but actually a forbidding, seldom-visited part of the State of Jammu and Kashmir.

Workers Carry Their Own Heat

Winters in the Vale of Kashmir also are cold; yet these handicraft "factories" had no source of heat. Each worker carries his or her own heat, a small earthenware-lined wicker basket, called a *kangri*, in which burn charcoal embers. This brazier is snuggled as close to the body beneath the garments as possible.

Walking through the Old Town of Srinagar was like stepping back into medieval Europe: narrow streets, crowded and confined, with people pottering away as they did centuries ago, pariah dogs everywhere, and somebody throwing a bucket of waste from an upper story when you least expect it!

On the Road to Ladakh, Kashmir's "Little Tibet," the Photographer Entertains Visitors

After a 175-mile walk from Leh, these Ladakhis paused at Sonamarg to inspect the National Geographic Society's photo-survey truck, a converted war ambulance. As Buddhists, they had little concern in Kashmir's Hindu-Moslem strife. Kashmir, predominantly Mohammedan, is ruled by a Hindu maharaja.

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A Moslem Potter's Daughter

At eight years, she's still free to play; hard work will come later.

Kodachromes by Volkmar Wentzel

Proud Father and Gloomy Son

Dressed up for a festival, the boy wears silver jewelry; his parent, the Kashmir woolen skullcap.

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II

Kodachrome by Volkmar Wentzel

In the Vale of Kashmir the Cold, Forbidding Himalayas Shelter an Earthly Paradise—Dal Lake

In Mogul times the emperors from sweltering Delhi established pleasure gardens beside these cool waters. Today their sanctuaries are public parks. On this flowery shore, shaded by huge chinar trees, an Englishman has anchored his houseboat. His servants go on an errand.

In Crumbling Grandeur Stand the Ruins of the Sun Temple

Martand, Hindu temple to the sun-god, has been called "a precious specimen of ancient art."

Surmounting a lofty plateau a few miles from Islamabad (Anantnag), Martand overlooks one of the world's finest views, the long, wide Vale of Kashmir. Sunset floods the sanctuary with golden light sacred to its deity.

The roof, whether of stone or wood, has collapsed, and two leaning wings give the impression of being about to topple.

The interior is bare of ornament, but the base is paneled with niches which reproduce the temple's form and enshrine its images (right). A colonnade of 84 crumbling pillars lies outside the camera's view. In olden days the ablution pool was used by pious Hindus.

The temple's age, supposed to be some 1,200 years, is uncertain, but architects are positive that Greek style influenced its builders. Whether it was wrecked by earthquakes or Moslem iconoclasts remains a question.

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Kodachrome by Volkmar Wentzel

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Main Street in Srinagar for Three Twisting Miles Is the Himalaya-fed Jhelum River

A water taxi, called *shikara,* passes beneath one of the city's seven bridges (Plate IX). Cargo boats are tied up on the right, a houseboat on the left. Shops of merchants and craftsmen line the water front.

Kodachrome by Volkmar Wentzel

Streets Cramped, Houses Jumbled, Kashmir's Capital Is Like a Medieval European City

Here minarets resemble spires and mosques are built of wood; three may be counted on the right bank. Hari Parbat, the hill on the right, is crowned with a fort.

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VI

Kodachrome by Volkmar Wentzel

From Morning to Night, Srinagar Craftsmen Squat on a Floor, Giving Their Eyesight to a Rug

So fine is the work and so dark the quarters in winter that eyes often fail. Turban, fez, and cap all cover Moslems.

Raw Silk Spills from Her Bonnet

Silk is an ancient industry in Kashmir. Women, who are not represented among most Srinagar trades, do a large part of the work in this factory.

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Leaves, Worms, and Cocoons

A cocoon is 1/12 pure silk.

Kodachromes by Volkmar Wentzel

Needleworkers, One Using Gold Thread, Embroider Intricate Designs on Silk

On a riverside balcony in Srinagar, they share the same water pipe (center).

© National Geographic Society

Kodachrome by Volkmar Wentzel

Riverman's Workshop and Home Is His Barge, Which He Poles on the Jhelum

Houseboats line the opposite shore, one (right) connected to its cookboat by gangplank. Europeans choose houseboats because they may not own Kashmir real estate. They have compensations. Without bothering to pack, they may move at any time the fancy strikes. Many moor beneath shady trees (Plate II).

Heart-shaped Paddles Drive the Gondola *Good Fortune*, Carrying Three English Passengers

Many Yanks on furlough rode Srinagar's *shikaras* during wartime. They enjoyed one comfort which even the luxury-loving Moguls never knew—inner-spring cushions. Some water taxis bear names such as *Mae West with Full Spring Seats* and *Dancing Girl with Full Spring Seats*.

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Kodachromes by Volkmar Wentzel

All the Comforts of Home, Including a Dog, Brighten a Retired Couple's Houseboat

In November, 1947, when Pakistan tribesmen raided Kashmir, some Europeans refused to flee because RAF planes barred their dogs. This Englishman, a member of the National Geographic Society, observed the photographer's truck and invited him to tea. His houseboat once belonged to a maharaja.

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X

Kodachrome by Volkmar Wentzel

Men of Pampur Engage in an Age-old Industry, the Collection of Purple Saffron Blossoms to Make Yellow Dye and Spice

Saffron, a word derived from the Arabic *za'faran,* comes from *Crocus sativus,* a bulb resembling the spring crocus. The ancients used saffron as a perfume and dye and as an ingredient in medicines. Various people eat it as a condiment; Hindus employ the pigment to make forehead marks. In famines Kashmiris have eaten the bulbs.

© National Geographic Society

Kodachrome by Volkmar Wentzel

For a Pound of Quality Saffron, Sorters Hand-pick the Stigmas of 75,000 Flowers, Three Stigmas to Each Blossom

This ancient spice is among the costliest. Wholesale price is about $32 a pound. Last year the United States took 17,600 pounds. Most of it went into drugs. Some was used to flavor and color foods. Cakes baked with saffron show a rich golden tint. A little goes a long way.

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At Autumn Harvest, Farmers, Pickers, and Buyers Swarm in Pampur's Saffron Market

Homer sang of the "saffron morn," Solomon of "spikenard and saffron." Greeks perfumed theaters with saffron, a royal color; Romans tossed it in Nero's path. England once cultivated the plant at Saffron Walden.

Kodachrome by Volkmar Wentzel

The Breeze from Saffron Gardens Is Heavy with a Delicious, Overpowering Scent

Pampur's sod roofs, sealed with mud, are shaggy with grass. Elsewhere Kashmir travelers have observed sheep and goats grazing on less tilted roofs. Some housetops appear aflame with tulips and poppies (Plate XIV).

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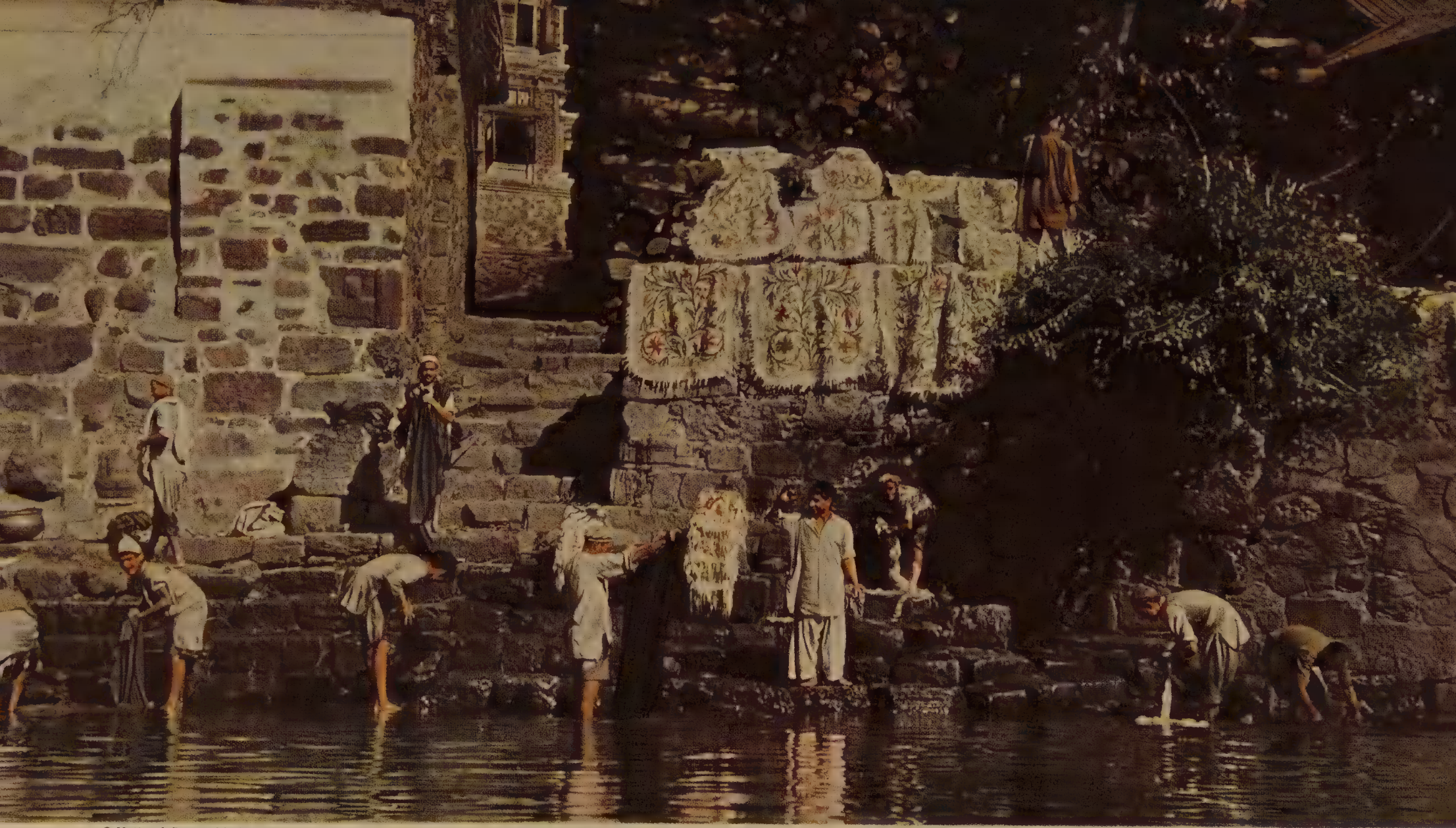
Kodachrome by Volkmar Wentzel

Srinagar Balconies Overhang the Jhelum as if Supported on Air; Timbers Bristle from a Wood Carver's Windows (Center)



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XV

Kodachrome by Volkmar Wentzel

Srinagar Needleworkers Wash Embroidered Felt Rugs in the Jhelum and Hang Them on the Ghat to Dry

Kashmir's shawl industry is but a memory. Many of its workers passed to the carpet trade. As undecorated felt, these *numdahs* came hundreds of miles by ponyback from Yarkand. The Jhelum is everybody's washtub; fish, brass gods, garments, teeth, and bodies are scoured up and down the stream.

Rug Weavers Specialize in Patterns Handed Down from Generation to Generation

© National Geographic Society

Kodachromes by Volkmar Wentzel

Lacquerers Paint Designs So Intricate that Some Brushes Contain Only Three Hairs

Wood and papier-mâché are the materials of these artists. Powdered-stone pigments come from the Himalayas.

On a relatively modern scale, however, is the silk factory in the city's outskirts. A wall encloses the factory buildings, which appear old but well-kept. Close by is a plantation of mulberry trees whose leaves are transformed into silk through the alchemy of silkworms.

In this factory I saw women workers for the first time in Kashmir. Dozens were squatting on their haunches around piles of cocoons, some of which were bright golden yellow, others almost white. The chattering of the women made a constant guttural gabble, but they proved shy when asked to pose.

Some had earrings so heavy that they were suspended from the whole ear instead of just the lobe. They wore voluminous dresses of printed cotton cloth, but the long, flowing sleeves did not seem to interfere as their hands flew in sorting the cocoons.

Much silk for parachutes came from here—Kashmir's chief contribution to the war effort. Machines help turn the gossamer strands into skeins like hanks of beautiful hair, some golden and others platinum blond, and finally into silken cloth which may grace some maharaja's wife or a woman of fashion in America.

A Floating Six-room House

In almost incredible contrast to the teeming life of the Old Town is the beauty that blossoms along Dal Lake. Going from a dingy handicraft factory with oiled-paper windows to a luxurious houseboat and the glorious gardens of the Moguls was like emerging suddenly into another world.

Many houseboats on the Jhelum are owned by retired British civil servants and businessmen, who thus solve the problem presented by the fact that under Kashmiri law they cannot own real estate.

One which I visited proved to be a floating six-room house, complete with all the comforts of home, including a fireplace. Its owner, a gracious Swiss-English gentleman, had noticed the National Geographic Society car and promptly invited me to tea, explaining that he had been a member of The Society for many years.

Boarding a shikara on the Bund, I gave the "taxi" paddler the address of the boat, which was moored on the opposite bank of the river.

As we approached, a sliding door moved noiselessly open and I stepped directly into a living room fit for a maharaja.

Actually, my host and hostess explained, the boat had belonged to a raja. When one of his wives died aboard, he decided that the boat was bad luck and sold it cheap. The beautifully paneled living room was now a happy wedding of East and West, with an English tea cozy and a Kashmiri samovar side by side (Plate IX).

Electricity was wired aboard, but water had to be carried from shore. Some of the native boatmen, incidentally, drink water from the river. Why it does not kill them I do not know.

In keeping with the leisurely pace of life on a Jhelum River houseboat is its "engine"—men with long punting poles who plant the poles firmly on the river bottom and push, walking slowly toward the stern along walkways on the boat's "topside."

Thus propelled, the floating homes occasionally get a change of scene, poking themselves slowly along the river and canals to Dal Lake like some deliberate, aquatic daddy longlegs.

At Dal Gate, which controls the flow of water, many houseboats are moored and about a hundred shikara boys lie in wait for tourist prey. One can go around this lake of delight either by boat or by road, and the pleasure gardens of the Moguls are now public parks, open to all. On the shore is the present Maharaja's palace, which sits back from the lake in walled seclusion.

From three sides snowy mountains look down on orchards of quince trees, fields of brilliant yellow mustard, bright flowers, and placid lake (Plate II). In July and August the lotus in bloom lends its delicate pink to the still waters. At sunset the scene is overpowering, with mountains, lake, and trees all melting together in a haze of purples and blues.

"Floating Fields" Sometimes Stolen

On the surface of the lake are "floating fields," aquatic plants on which earth and vegetable matter have accumulated, where melons and vegetables are grown. Occasionally complaint is heard that someone has stolen one of the fields, for it is entirely possible to tow them away with boats by night.

But the crowning glories of this lake, only five miles long and less than two miles wide, are the justly famous pleasure gardens, like miniature, highly formal Edens.

Great gardeners, the Moguls placed their personal versions of Paradise by the lake and made fullest use of the streams coming down from the snowy mountain backdrop. The clear, sweet life streams of the gardens flow through the pavilions and other buildings, pause in reflecting pools, then cascade down to other levels. In the days of the Moguls colored lamps glowed behind the waterfalls.

On tiny islands within the larger reflect-

A Srinagar Craftsman in Horn-rim Glasses Sits at His Loom, Weaving a Wall Piece

"Pashmina," the sign on the wall, refers to his material. *Pashm,* the soft undercoat of mountain-raised goats, is woven into delicate fabrics called pashmina. Pashmina helped make the Kashmir shawls famous. Now it goes into rugs, together sometimes with inferior substitutes. This elderly weaver shows a sample of his art (lower right). He works from a paper pattern on his loom. Each bobbin holds a change of color in the pattern (page 528).

ing pools the Moguls and their ladies sat amid fountains which kept the air cool—their own air-conditioning system. Surrounded by walls of playing water, they could forget the heat of the plains.

All the gardens are more or less alike, differing only in size and coloring, like gems. All are symmetrical and formal, with carefully trimmed trees and hedges, and beds of brilliant flowers. The sensuous Moguls chose flowers for harmony of scent as well as color.

Smallest, but most appealing to me, was the little Chashma-i-Shahi, or "Royal Spring," which draws its sustenance from a spring on a slope above the lake. It was probably created by the Mogul emperor Shah Jahan.

Nishat Bagh, laid out by Emperor Jahangir's prime minister, well merits its name, meaning "Garden of Gladness."

But the most famous of all is the Shalimar Bagh, created by Jahangir for his beloved wife, the famous Nur Mahal, "Light of the Palace." It has a magnificent black-marble pavilion, built later by Shah Jahan. Part of this garden was reserved for the court ladies and was called "Abode of Love." Now electric light, a happy anachronism, enhances Shalimar's charms.

"Where Are You Now?"

Here, fittingly enough, I had my first and only sight of a girl worthy of the poets' praise of the beauty of Kashmiri women. It was Sunday and the park was full of people. As I sought new camera angles, a veil was suddenly drawn aside and I found myself drowning in the depths of the largest and darkest eyes I had ever seen.

The owner of the eyes was a strikingly beautiful Moslem girl with a baby sitting on her shoulders. Long lashes dropped, but

With Soulful Eyes a Nomad Regards Her White Buffalo Calf

Gujar tribesmen and their buffaloes are lifelong partners in the Kashmir milk business. When spring melts the Himalayan snows, off they go together to the heights, where the Gujars live in crude temporary homes like Indian wigwams. A buffalo cow calves at four to five years and yields milk the next eight months. From it the Gujars make butter, which is converted into *ghee,* the clarified butter oil of India. In the Liddar Valley, where the photographer encountered this pair, he sampled buffalo "cottage cheese" (page 549).

there was a trace of a smile and I nerved myself to ask, in sign language, if I might make a picture.

She nodded consent, but as I peered through the finder I saw that she was gone. Looking up, I saw my picture rapidly departing. A stern-looking Moslem man had appeared from nowhere and was physically propelling her away.

Never more appropriate seemed Laurence Hope's *Kashmiri Song,* with its sad note of frustration:

> Pale hands I loved, beside the Shalimar,
> Where are you now? Who lies beneath your spell?
> Whom do you lead on Rapture's roadway, far,
> Before you agonise them in farewell?
>
> . . . .
>
> Pale hands, pink-tipped, like lotus buds that float
> On those cool waters where we used to dwell,
> I would have rather felt you round my throat,
> Crushing out life, than waving me farewell! *

But since a photographer's frustration is hardly comparable to that of a lover, I did not pursue the matter further, preferring not to have any hands, pale or otherwise, "round my throat, crushing out life."

Hitchhikers, Even in Kashmir

Bountiful crops as well as ornamental trees and flowers grow on the well-watered slopes between the mountains and the lake.

One day, as I was passing the Shalimar Bagh by car, four men and a woman stopped me. Moslem farmer folk, they were trying to hitchhike to the city to sell several bags of walnuts they had grown. Kashmiri walnuts are superb and are exported widely.

When I offered to buy them, the delegation promptly sold me the whole load for

* From *Complete Love Lyrics,* by Laurence Hope. Copyright, 1902, 1909, by Dodd, Mead & Company. Reprinted by permission.

Doctor's Large Needle Brings a Wince of Pain, but It's Better than Cholera

Cholera, scourge of Kashmir, breaks out every few years. The great epidemic of 1892, which reached Great Britain and the United States, took the lives of 11,700 Kashmiris. Entire villages were ruined, farming areas were abandoned, and all business was stopped. Now the State tries to wipe out the pestilence with inoculations. These Srinagar boys volunteered. By contaminating food and drink, the housefly (on forehead) spreads the cholera microorganism.

one rupee (about 33 cents). The nuts filled two 5-gallon gasoline cans.

These simple farmers did not haggle; in fact, the five seemed pleased at their "bargain." The price apparently was at least as high as they would have received at market, and the chance encounter saved them the trouble of going to town.

From Srinagar we sallied forth in our ambulance to see the outlying countryside.

For such trips the Kashmiri who can afford it usually travels by bus, since his country has only 20 miles of railroad—the short line into Jammu from the Punjab.

A typical bus consists of an American chassis on which a wooden body has been built.

Each bus is divided into first-, second-, and third-class sections. The first, up near the driver, has seats for only three or four persons. The other sections are larger but progressively more crowded, so that back in the "steerage" the passengers are frequently packed in so tight that they form a solid mass.

As we passed through a small village on the way to the temple at Martand (Plate III), we suddenly encountered two Moslems swinging long swords wildly over their heads, while behind them pranced male dancers dressed as women. This somewhat alarming demonstration proved to be only a wedding procession, with the bride and groom riding in a boxlike contrivance suspended on long poles borne by their friends.

When the gay wedding party noticed my camera, there was such a rush to get into the pictures that I was practically mobbed. We did not linger, since the festive spirit was a bit too high for comfort.

Many country folk along our route were harvesting and drying saffron flowers, which paint the fields with purple and fill the breeze with their perfume. Hundreds of hands were

extracting the flower parts which yield saffron, much in demand as a condiment and as a yellow pigment for Hindu forehead marks (Plates X-XIII).

On another trip we followed the Jhelum downstream from Srinagar to the point where it widens into Wular Lake. Although only about 6 by 15 miles, this is the largest permanent natural fresh-water lake in India. Seasonal floods expand it considerably. Shallow and fringed with reedy marshes, it seems a remnant of the great lake which legend says once covered the Vale of Kashmir (page 524).

Waterfowl abound, and here the Maharaja and his friends shoot hundreds of ducks. I saw the score sheet of one such hunt. The Maharaja bagged the most, and the scores of the others descended strictly in the order of their rank.

In a pasture on the outskirts of Srinagar Mohammedans were celebrating a religious festival. The celebration had all the gaiety of a county fair in the United States, except that at the hour for prayer all the fun would suddenly stop, the crowd would form into two large kneeling groups, and all would bow low to the ground. Then the festivities would start again.

Here I saw a traveling beauty shop—a man with a stick of antimony who gave the celebrants, of either sex, a dab or two of dark shadow under each eye for a couple of coppers. Perfume was heavy on the air. All wore their newest and best clothes, and women, and children, too, were loaded with elaborate jewelry (Plate I).

On our next trip we headed for the beckoning mountains. Driving east from Srinagar to Pahlgam, we hit the trail on foot to Arau, and there hired ponies and camping equipment for the trek to Kolahoi Glacier, on the slopes of the Matterhorn-like mountain of the same name.

Striped and Dotted Sheep

We were not alone, for the people of India flock to such resorts, just as New Yorkers on vacation hie to the Catskills and Adirondacks. The little wayfarers' cabin at Arau, where we spent the first night, was packed with Sikhs, Hindus, Mohammedans, and English, and suddenly I heard the unmistakable accents of another American. He proved to be a teacher from Forman Christian College in Lahore, who was taking his Indian students on a tour.

As we rode up the pretty alpine valleys on our hired ponies, we sighted the strangest-looking sheep I had ever seen. Broad bands and dots of red, or red and blue, made them look like circus freaks. These marks, however, were merely the painted brands applied by the Chopans, or shepherds, a nomadic mountain people.

Also at high altitudes live two other tribes of herdsmen, the Gujars and Bakarwals. Those I saw were sturdy people, shy but frank, honest, and hospitable. From them the inhabitants of the Vale get much of their milk and wool (pages 527 and 547).

Some of the Bakarwals served us cheese, using a leaf as a dish. It tasted good, somewhat like cottage cheese. The men were bearded and patriarchal in appearance. The women were large-featured and not uncomely, with braided hair, little round caps, and silver jewelry. They were wholly different from the people I had seen thus far in Kashmir.

Above timber line we ran into rain and snow, and by the time we reached the glacier we were all soaking wet and panting from the altitude. In the big ice cave at the glacier's base we partially regained our breath. I think we were all glad when a broken strap on one of my Kashmiri sandals gave a good excuse for not going farther.

Leaving the Vale by the Back Door

Among the beauties of the Kashmir mountains are the lofty *margs*, or grassy alpine meadows. At Gulmarg, a popular resort, part of the marg has been transformed into a golf course. So arresting are the peaks in the background that it must be almost impossible to keep one's eye on the ball.

The lofty snow-covered ranges in the distance loomed like a challenge. My car was temporarily out of commission with a shredded fan belt. Why not climb farther into the Himalayas, where no wheels could move, anyway, and trek into "Little Tibet"—Ladakh, as different from the fruitful Vale as if they were on two different planets?

Thus it came about that I left the Vale by its back, or eastern, door.

A vulcanizing job on our fan belt carried us the 40 miles from Srinagar to Sonamarg, "Meadow of Gold," at more than 8,500 feet, which was as far as the motor road went. There we loaded ourselves and equipment on six ponies.

There, too, we met our first Ladakhis, Tibetans who might have stepped straight out of the pages of *Lost Horizon*. They wore felt boots, homespun woolen robes, and little hats which looked as if they had been thrown on their heads from a distance (Plate I).

It was bitter cold and our hands were numb as we strapped the loads on the ponies next morning. The first rays of the sun had not

Srinagar Carvers, Who Never Heard of Power Saws and Lathes, Do All Work by Hand

With primitive tools this man and his apprentice create the most delicate designs, many of them in hard black walnut. They turn out beautiful furniture, decorative screens, and handsome boxes.

yet penetrated the valley, but they played on the high, snow-covered peaks, outlining them in delicate pastel shades.

Mohammed led the way through fields and forests covered with hoarfrost, upon which the sun soon shimmered with an effect like thousands of little mirrors.

After about nine miles the valley seemed to come to a dead end. But Mohammed pointed high to the northeast, and above the timber line I saw a narrow trail hugging the steep mountainside. This was the approach to the Zoji La, gateway to the Tibetan plateau.

Amarnath Cave Sacred to Siva

For several hundred miles in this direction the Zoji La (*la* in Tibetan means "pass") is the only gap in the great snowy Himalayan wall. The summit of the pass itself is at 11,580 feet, whereas the surrounding peaks average 18,000.

But Ram, the Hindu, was looking southward.

"Over there," he said, "is the cave of Amarnath,* the legendary abode of our Lord Siva, the Destroyer and Re-creator. Since remote times thousands of Hindu pilgrims have wound their way annually to worship Siva, who is there incarnate in a block of ice. The sacred cave might be compared to the Mecca of the Mohammedans."

With our hearts pumping heavily we toiled upward. The road now was a narrow path which clung to a precarious mountainside. Except for a few pretty silver birches, all vegetation had ceased.

In this dead world we looked like some unfortunate band of beings who had been marooned on the moon or on some uninhabitable planet.

This other-worldly effect was heightened by a small caravan of Tibetans who met us as we rounded a sharp turn. The leader was a wizened old character in a long dirty coat of homespun wool. Over this hung one long pigtail and a series of cloth amulets strung around his neck. A floppy cap was jauntily perched on his head. He gave us a cheerful greeting.

Shortly before we reached the summit we paused for a last glimpse into the rich green Sind Valley, which wound its way thousands of feet below.

What a prize this Vale of Kashmir must have seemed to the rough, dirty, hard-as-nails Mongol hordes coming south from the cold heart of central Asia! And no wonder their descendants and heirs, the Moguls, sought earthly paradise in this air-conditioned Vale! †

* See "Pilgrimage to Amernath, Himalayan Shrine of the Hindu Faith," by Louise Ahl Jessop, NATIONAL GEOGRAPHIC MAGAZINE, November, 1921.

† For additional articles on India, see "NATIONAL GEOGRAPHIC MAGAZINE Cumulative Index, 1899-1947."

Down Mark Twain's River on a Raft

By Rex E. Hieronymus

A TRIP down the Mississippi River on a homemade raft is one of boyhood's most cherished dreams. This is the story of two boys whose fathers turned that dream into 1,400 miles of reality.

I might as well confess right now that we two fathers, Tom Roth and I, felt the lure of the big river as strongly as our sons. We shared with Tom's 12-year-old Tommy and my 15-year-old Dick the conviction that a vagabond river journey was the peak of adventure (page 554).

We would ride the river on a raft—did not those prototypes of all adventurous Mississippi travelers, Tom Sawyer and Huck Finn, sail a raft? All right, we four would build our own craft and fare forth.

If we ever need concrete reminder of our adventure, Tommy has the 12-inch bronze propeller which pushed our floating magic carpet down the river from Chicago to New Orleans. And Dick has the brass-mounted mahogany steering wheel he and I made in a basement workshop to guide our craft on the long voyage (map, page 553).

The boys' confidence in our ability to design and build the raft and then navigate her from Chicago to New Orleans was a challenge.

For a time war delayed us, but shortly after V-J Day we began work on designs for the raft and plans for the trip, and undertook serious study of charts and pilot rules.

Shipbuilding in a Basement

Early in January, 1946, we started actual construction of the raft, dubbed the *Meanco* by the boys, short for their ambitious name for our outfit—the Mississippi Exploration and Navigation Company!

For six months Tom Roth's basement in suburban Western Springs, Illinois, was a beehive of cutting, fitting, threading, tapping, and painting, until one evening in early June we sat back on our heels and surveyed with pride the unorthodox conveyance that was to be our home on the month-long journey.

In licensing us, the Coast Guard dignified the raft as a "power-driven open boat, more than 15 and less than 26 feet long," and issued us the number 39-E-344, authorizing us to traverse the inland waterways and entitling us to service through locks, the raising or swinging of interfering bridges, all Coast Guard information services, etc. But their official language fell far short of conveying any picture of what the *Meanco* was really like.

Properly she could be described as a double-pontoon catamaran raft, powered by an outboard motor. The frame and deck were constructed on two parallel pontoon floats, eight feet apart (page 557). Each pontoon consisted of five 55-gallon steel oil drums, the front and rear drum of each side assembly being provided with a welded cone of heavier steel to streamline the floats and provide additional buoyancy.

The drums were not welded solidly together, but were fastened rigidly into wood and steel saddles to which the tanks were secured by steel straps. Total buoyancy of the pontoons was 5,028 pounds.

Our power plant was a 22-horsepower outboard motor mounted toward the rear, midway between the two pontoons; for steering we set a conventional wheel forward.

We secured an olive-drab tent to the deck and stowed a duffel locker and two cots inside to provide three bunks; the fourth was atop the icebox locker.

Pontoons Carry Fuel and Water

Fuel was carried in one of the 55-gallon drums, water for washing, etc., in the corresponding drum on the opposite side. Drinking water we carried in containers on deck.

For cooking while under way we used a special double-walled, steel oven-stove, heated by exhaust gas from the motor. We cooked on a gasoline camp stove or over a campfire when we were ashore.

The *Meanco* was 10 feet wide by 21 feet long, her deck space 10 by 15 feet. Clearance, including the flag mast, was 11 feet 3 inches. She was neatly and durably painted, pontoons and below-deck gear in aluminum and green, and deck and superstructure battleship gray with a gay trim of Chinese red.

Tom and I were confident our raft was sufficiently shipshape and river-worthy to assure our primary aim: the construction of a craft that was in keeping with the adventurous spirit of our trip, but one in which our boys would not be exposed to needless danger or discomfort.

The *Meanco* Sets Sail

On the cool June morning when we proudly launched the raft in the canal near Summit, Illinois, our assurance was justified. Easily she floated, to the astonishment of bystanders who audibly doubted that anything that peculiar looking *would* float.

Fenno Jacobs from Three Lions

Old Man River Gives Up ■ 44-inch, 50-pound Mississippi Channel Catfish: Off St. Louis

In the early afternoon of June 29, fully provisioned and shipshape, the raft was ready to go. Tom Roth, Tommy, Dick, and I, with a friend who was going along about 100 miles "just for the ride," waved to family and friends gathered to bid us bon voyage.

With Dick at the helm and Tommy breaking out the flag, we dropped slowly down the canal. New Orleans lay 1,400 miles, a whole month, ahead.

Boys Anxious to Steer

Quickly our days shook down into a routine of navigation, cooking, making up for the night, etc. At first the boys were eager to do all the steering, alternating every half-hour.

Later the novelty wore off, and we rotated duties, establishing one-hour shifts for the three duty positions—helmsman, navigator, and chief engineer—with the fourth man off duty, free to watch the passing shores or snooze in the tent shade (page 564).

We used the motor always when under way, except during lunch and while fishing for catfish. Then we would drift along, free to enjoy food and companionship, giving only "lookout" attention to navigation.

Though equipped with lights and signals for sailing at night in case of emergency, we chose to sail only during daylight hours; we didn't want to miss anything interesting by sailing past it in the dark.

Evenings we swam, and after supper the galley was the scene of many a "jam" session, during which Tom and I became really acquainted with our sons in an intimacy for which we had seemed never to have enough time in the hubbub of city life.

We shared the indescribable beauty of dusk and nightfall in cove or bayou where, tied up off the sailing channel for the night, we went to sleep to the cries of whippoorwills and hoot owls (page 562).

There was the awakening call of the cardinals at dawn, when the dew on our blankets and on the whole raft was heavy as from a gentle rain. Then a dip in the river lasted until the delicious smell of wood smoke, mingled with the aroma of bacon and eggs and coffee, got us out of the water and into our clothes in a hurry.

On down the Illinois River we sailed, mile by mile—Peoria, Havana, Beardstown, Montezuma. At 1:10 p. m. on July 5 we cleared Mason Island and Island No. 526 and sailed out onto the broad bosom of the Mississippi!

That night we tied up at Grafton, Illinois (page 555), planning to buck the big river on the morrow. We were six days, 313 miles from home, right on the button at the

Chicago Tribune

Chicago's Huck Finn and Tom Sawyer Join Their Fathers on a Raft Adventure

Water, water everywhere, but not for drinking. At Summit, Illinois, the voyagers load their own on the eve of their departure. Ahead of them lie 27 days of lazy drifting on 1,400 miles of waterways. Their outboard motor served them all the way to New Orleans, but the propeller's shear pin snapped when 200 feet from the final landing (page 574). Rex E. Hieronymus, the author (right), and Tom Roth face their sons, Tommy Roth (left), 12 years old, and Dick Hieronymus, 15.

52-miles-a-day average we had hoped for.

It was hazy as we swung out into the Mississippi next morning, visibility only a mile and a half and the channel so wide we had difficulty reading the navigation markers ashore. At one o'clock we picked up the muddy Missouri on our starboard side.

The gradual merging of the two streams was an interesting sight; for a distance of six or seven miles we could see huge blotchy swirls rolling about in the clear water of the Mississippi as the waters of the two rivers intermingled. In an hour or so the whole river was turbid and soiled, as it was to be all the way to the Gulf.*

Room for 314 *Meancos*

We had a thrill at the big Mississippi Lock and Dam No. 26 at Alton, Illinois. We expected to be put through the smaller of the two locks, but the lock keeper had heard about us and paid us the honor of putting us through the big basin, 600 feet long and 110 feet wide (page 571).

While the lock chamber was emptying, I calculated there was room in there for 314 rafts the size of the *Meanco*. We really rattled around.

We had been warned about the treacherous current near the Chain of Rocks Bridge above St. Louis. Tommy was at the helm as we approached it, Tom checking on the charts.

Young Tommy brought the *Meanco* through the eddies like a veteran, and soon we were anchored off Market Street at St. Louis.†

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Taming the Outlaw Missouri River," by Frederick Simpich, November, 1945; and "Trailing History Down the Big Muddy," by Lewis R. Freeman, July, 1928.

† See, in the NATIONAL GEOGRAPHIC MAGAZINE, by Frederick Simpich, "These Missourians," March, 1946; and "Missouri, Mother of the West," April, 1923.

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Where the Illinois (Right) Joins the Main Stream, the Mississippi Is Still Clear Water

Twenty-three miles below the confluence, the Missouri empties its chocolate current, and thereafter the Father of Waters is a muddy yellow. Here clashing currents have dumped silt, forming five wooded islands, one partly cleared for farming. On the right, Highway 100 leads through Grafton, Illinois.

St. Louis friends came aboard to visit and later took us ashore for a delicious steak dinner. That night aboard the old showboat *Golden Rod* we saw a performance of "The Drunkard," that perennial favorite of showboat audiences.

Chester, Illinois, and Cape Girardeau, Missouri, provided us anchorage on succeeding nights. Down we dropped toward Cairo, Illinois, where the Ohio joins the Mississippi, at the beginning of what is called the Lower Mississippi River. At that point we would be 530 miles from home.

The serene, uneventful days became a cause of complaint to the boys; they pined for some outright excitement.

"Shucks," said Tommy, "there's nothin' to it. I thought there would be some big waves or sumpin'."

"Don't worry, son," said his father. "We aren't to New Orleans yet."

The river was higher than normal for the time of year, about 15 feet above mean low water. Above Dogtooth Bend, 150 miles below St. Louis, where the river is about a mile across, there is a wide turn, and the sailing line of the dredged channel follows the outside bank. Tom was steering.

"Hey, Rex," he called, "the river's pretty high. What say we cut across over the towhead? It'll save a couple of miles."

According to the charts, there were sandbars and towheads in the bend at low water, but, with the river at 15-foot stage, we should clear them easily, I agreed. Our pontoons drew only about a foot and a half of water, though the propeller extended another foot below them. Tom veered her to port and we started across the cutoff.

Suddenly we felt the propeller chewing sand, and, before we could move, *Meanco* lurched to a stop. We were aground!

Our position wasn't good: nearly two tons of raft rammed on a hard sandbar in the middle of the Mississippi River half a mile from shore—no place to lighten ship.

Rex E. Hieronymus

Dick and Tommy Nail Down the Deck. Each Hammer Stroke Brings Adventure Closer

Here the raft, her parts built in a basement, is assembled on the bank of a canal near the boys' home, Western Springs, a suburb of Chicago. "Will she float?" skeptical bystanders asked. For answer, the boys pointed to the two pontoon floats, each composed of five steel oil drums. Buoyancy was 5,028 pounds.

"Well," I mourned in self-condemnation, "this needn't have happened if I had been swinging the lead."

"How'd you like to spend your vacation right here, Tommy?" asked his father.

"You and your short cuts!" his son came back.

Tom and I went overboard, shin-deep in the turbid water, and soon discovered that the sand bottom was really hard. Even though relieved of our weight, the raft was stationary as a rock.

"Isn't this some river?" exploded Tom in disgust. "A mile wide and only 12 inches deep!"

Downstream ahead of us the water was even more shallow; therefore, to float the raft we should have to work her back upstream against the swift current. The boys came over the side to add their efforts to ours, but even the four of us couldn't budge her. The only way we could get off the bar was to lighten the raft.

River Falling 5 Inches in 24 Hours

The man at the gauging station had told us that the river level was falling about five inches in 24 hours. That meant we had to get the *Meanco* afloat before nightfall.

"This situation calls for a lemonade," hinted Tom. "Coming up," Tommy replied.

Over the cool drinks Tom and I figured that we probably should have to lighten the raft by at least 1,200 pounds to free her.

There was not much we wanted to jettison outright—only about 365 pounds of fuel and water.

To make the necessary weight, we decided to tie to the raft all the things that would float and not be ruined in the water, and to heave them over.

In addition, we emptied the ice locker, plugged the drain, set it afloat, and then put the things back in it as a raft. Out on the sandbar went the two 6-volt car batteries and the old Dodge electric starter-generator. Not only did their going help lighten ship, but they served to anchor some of our possessions.

It was a 2-hour job to get all the stuff off the raft, but by noon we were ready to try shoving her off.

To break the suction of the pontoons on the bottom, we bounced each corner of the raft. With a saucepan and a pike pole we cleared the sand from around the propeller and scoured out a groove upstream for it.

These preparations ended, Tom and I took positions at the forward ends of the two pontoons, ready to heave. Dick and Tommy stood by to start the motor, using the pull cord, since our electrical system was now "on the bottom."

Rex E. Hieronymus

Built Catamaran-fashion, *Meanco* Straddles Two Floats the Size of One-man Submarines

This "power-driven open boat" had Coast Guard authorization to pass through all locks and swinging bridges. She is stoutly constructed (page 551). Neither storm nor shoal nor 7-foot wave made much of a dent. Decked with tent and lawn chairs, she here pursues her vagabond life, at anchor off Missouri.

Dick yanked the cord and the motor caught. Tommy threw the compression lever, set the spark, and gave it full throttle; then both jumped off to push. With the motor roaring, we heaved, yawing and bouncing in unison.

4-Man Power Moves the *Meanco*

Gradually, inch by inch, the raft crept upstream. Heaving and pushing with renewed vigor, we got her in motion again, and were fully afloat when we had pushed her 30 feet. The boys climbed back aboard.

Tom and I trailed the raft until we were wading waist-deep, then swung aboard, cast the anchor upstream, and killed the motor. We were free, hot as firecrackers, bedraggled, and thoroughly "bushed," but masters of the situation again.

We reclaimed our gear by towing the floatables back to the raft and wrestling them aboard—tent and bedding, cots and chairs. The ice locker looked for all the world like a floating coffin. Finally we dredged up the starter and batteries.

Reloaded, though not reorganized, we cranked up and worked back into the main channel. A mile or so downstream we anchored at a pleasant wooded place, prepared lunch, and fell to.

Our misadventure brought home to us forcibly that we were not masters of the art Mark Twain described in *Life on the Mississippi*—judging depth of water by surface appearance. Indeed, we never did attain proficiency in this delicate judgment.

After getting everything shipshape, we dropped on down the river and at 3 p. m. sailed under the Cairo-Mississippi River Bridge, rounded Cairo Point Light, and turned up the Ohio River to dock at the landing for supplies.

Near the Cairo-Ohio River Bridge we became aware of ominous thunderheads piling up in the Ohio Valley to the northeast. We debated the wisdom of turning back around the point where we could lie protected under the peninsula on which Cairo stands.

"We can't run away from every little blow," Tom objected. So we cruised on up the Ohio, looking for the wharf.

Meanco Rides Out a Storm

We were well beyond the center of town and had passed the gauging station when the first gusts hit us, kicking up whitecaps. Waves four and five feet high followed.

We made the boys don their life preservers, and had them check the tent ties and latch the front covers together, leaving only the three-cornered helmsman's lookout.

When the rain and high wind really hit us, the raft bounced like a cork. It was almost

St. Louis Post-Dispatch

Zipping Past St. Louis, *Meanco* Shows How She Averaged 52 Miles a Day. Far from Workaday Cares, Fathers Learn to Understand Sons

Meanco's name stands for Mississippi Exploration and Navigation Company. Her crew calls to mind the American flatboat men who, before the days of steamboats, floated downriver to New Orleans on rafts loaded with tobacco, fruit, furs, grain, flour, hams, and whisky.

Webb from Standard Oil Co.

Near Baton Rouge Bridge, *Sprague* Churns Up a Wake Such as That Which Almost Wrecked *Meanco*

Fenno Jacobs from Three Lions

A Towboat Shoves Its Barges Beneath Parallel Highway and Railroad Bridges Linking Memphis (Right) to Arkansas

Charles R. Ford

Sky's Whirling Black Fist Smites the Shore. A Moment Later the Tornado Lashed the Father of Waters

One afternoon in 1938 a steamer's captain saw the whirlwind's approach off Kentucky. Seizing his camera, he made this exposure. The storm center missed his ship by 100 yards. *Meanco,* surviving a storm-swept river, learned the next day that she had ridden out a near-tornado (page 562).

Fenno Jacobs from Three Lions

On a Miniature Mississippi, Whose Waters Flow Through Screen Mesh Representing Flooded Woodlands, an Engineer Reads a Gauge

Following the disastrous overflow of 1927, the U. S. Waterways Experiment Station was established at Vicksburg, Mississippi, to test control devices. This 1,055-foot scale model represents a 600-mile channel. Its Lilliputian day is only five and a half minutes. One cubic foot of water does the work of 1,500,000. Metal labyrinths reproduce the retarding effect of willows and other trees. At Clinton, near Jackson, Mississippi, work is proceeding on a 31-State model of the entire Mississippi Basin.

Rex E. Hieronymus

***Meanco* Moors to a Dead Tree; the Boys Finish Breakfast. School Seems Far Away**

Three nights out of Chicago, the raft berthed in this Illinois River backwater, safe from the peril of passing boats. Her passengers drifted to sleep to the cries of whippoorwills and owls (page 553).

impossible to see 50 feet ahead. The *Meanco* pitched so hard that her propeller was out of the water and the motor racing free about a third of the time.

Suddenly we realized that we were losing headway against the combined forces of the wind, waves, and current and were in danger of being smashed into the barges tied up along the levee.

We threw out the anchor, hoping it would hold us against the strong drag. It slowed our drift enough to enable Tom at the wheel to warp *Meanco* shoreward.

We were now about 10 yards off the rock levee and about 30 yards upstream from the nearest barge. Relentlessly we were being pushed into a pile-up on one or the other.

The waves were breaking so high on the levee that we couldn't see its formation. We were soaked both by the waves and by drenching rain.

Tom and I, trying to decide what to do, had to shout to be heard above the shrieking wind. Tom ducked out from under the tent and Dick took a firm grip on the wheel.

"Just try to hold her offshore!" we shouted.

We stationed Tommy at the motor to kill it when we signaled, or to kill it anyway, signal or no signal, if we started bouncing on the foot of the levee.

Beaching the Raft

Five yards off the levee, we noticed a gravel roadway coming down to the water, about 10 yards astern. We decided to try beaching the raft there; at least, the road should provide secure foothold.

Tom grabbed a forward line, and each of us seized a pike pole and by sign language told Dick to warp her in toward shore. As we swung in over the roadway, we signaled Tommy to cut the motor, and Tom and I jumped off onto the levee, slithering around in the waves as we tried to gain a foothold on rocks we couldn't see.

Safely ashore, Tom took the line ahead and secured it around a rock, while I sank my pole into the fender timber along the side of

Rosskam from Standard Oil Co.

"Towboat" Is a Misnomer; the *Jack Rathbone* Pushes Her Train of Oil Barges

As in Mark Twain's day, the Mississippi is again a mighty highway. Gulf coast oil and sulphur are shoved as far as the Twin Cities, Chicago, and Pittsburgh. One record-breaking tow contained enough oil to fill a tank-car train ten miles long. In his little glass house, Pilot Decareaux takes a sight on the jack staff 650 feet ahead and guides his tow through shifty, tortuous channels. Where the least miscalculation would bring disaster, he has to estimate current, wind force, and drift. In uncertain waters a deck hand still heaves the sounding line overboard and sings back, "Mark twain!" (12 feet).

the raft in an effort to hold her over the roadway and off the rocks. With Tom fending her off aft, the craft seemed out of danger for the moment.

Tommy and Dick, uninstructed, but aware of the danger of smashing the propeller, had tipped the motor and latched the drive shaft up out of harm's way. They were good sailors.

The wind had lessened a bit, and we were holding our own until the anchor dragged a few feet more and the port aft pontoon began to pound on the causeway. I shouted and signaled to the boys to move forward. That would lighten the aft end a little and decrease the pounding.

Dick and Tommy started to obey, then engaged in what appeared to be an argument. Instead of going forward, they both jumped into the surf and fought their way to us through the churning water, spluttering and stumbling, looking like a couple of half-drowned cardinals in their red life jackets.

Dick grabbed the pike pole with me and Tommy with his dad, and the four of us were able to ease her off so that she was no longer pounding.

There we stayed for a half-hour, until the storm spent its fury and the river began to quiet down.

No Damage Done

The boys chucked their life preservers and went up on the levee to explore while Tom and I inspected the pontoons for damage. There were a few dents but no holes. We had come off lucky.

Just how lucky we didn't know until next morning. While rounding up provisions and gasoline in Cairo, we learned that tornadic winds had struck the afternoon before. The

Rex E. Hieronymus

Ten Days from Home, Tommy Dozes While Dick Steers. The Novelty Is Wearing Off

At first the boys were so eager to take the wheel that they alternated each half-hour; but when routine settled in they shared a one-hour shift. Three duty positions—helmsman, navigator, and engineer—left the fourth hand free to watch the passing shore or catch forty winks (page 553).

wind was estimated to have attained a velocity of 60 miles an hour, with gusts up to 80 miles.

We preened ourselves at this news.

"And people said the *Meanco* couldn't weather a storm!" Tommy exclaimed. "They didn't know we were old raft builders."

The day had been a full one, what with going aground and then bucking the storm. Dinner was ready in record time, and we were soon in bed.

Next morning we left Cairo at 7 o'clock and breakfasted on the way down the river. That day we touched four different States—Illinois, Kentucky, Missouri, and Tennessee.

"Swell way to study geography," Tommy commented.

"Swell way to go south," said his father. "No cops, no arguments, and no crumpled fenders!"

The River Yields No Wrecks

While we were planning the trip, the boys had talked eagerly of finding old wrecked steamboats on which they could conduct salvage operations. But they finally came to the sorrowful conclusion that wrecks disappear in a hurry. We had not sighted a single one.

Souvenir hunting deteriorated into a sharp-eyed search for interesting items in the debris that floated along with us. There was an abundance of that.

But the flotsam mostly consisted of fence posts, planks, stumps, and trees, with an occasional chicken coop or barn door, and at rare intervals the carcass of a hapless animal.

Rivermen Warn of Stern-wheeler *Sprague*

In several ports we were invited by the rivermen to come aboard and look over their craft. We enjoyed inspecting the Diesel tugs, paddle-wheel boats, and river ferries (opposite page), and returned the courtesy by inviting the pilots and engineers to come aboard the *Meanco*.

They regaled us with tales of their river experiences and warned us of pitfalls ahead. They advised us to stay away from the paddle wash of the big craft, all mentioning particularly the *Sprague* as the leviathan of the river and direfully predicting that we might easily capsize in her wake.

"What's she like?" the boys asked.

"Boy, she's the biggest stern-wheeler ever built! She's got over 2,500 horsepower and her wheel's at least 36 feet through and more than 36 feet wide. She's the biggest thing on the river and she sure musses it up when she goes through. You stay away from the *Sprague*!"

We had learned that for equal size and power the paddle-wheel boats kicked up much rougher water than the modern propeller boats,

Rex E. Hieronymus

Off Helena, Arkansas, Captain Hill Welcomes the Boys Aboard the Ferry *A. C. Jaynes*

As most rivermen were just as curious about *Meanco* as its crew was about their Diesel tugs and paddle-wheel boats, visits were exchanged frequently. Captain Hill, leading an inspection of his pilothouse, shows how steering is controlled by steam power. His old 8-foot wheel is reserved for emergencies.

and that stern-wheelers are much worse than side-wheelers.

We had met both types and learned how to take their wash without getting bounced around too badly. We weren't particularly worried about them, but we did decide to watch out for the *Sprague* and give her a wide berth.

The pilots cautioned us about the sudden violent storms that blew up this time of year. After our experience at Cairo, vivid in our memories, we knew these croakers of disaster weren't talking idly. But we were all convinced that none of them appreciated the sturdiness of the *Meanco*.

"Look Out for the Eddies!"

Invariably the old pilots got around to the subject of the eddies. Three particularly fearsome spots were the ones most often mentioned.

"Look out for the eddies at Yellow Bend, Arkansas. Last year a 30-foot powerboat was lost there."

"You don't have to worry about the river, except to stay out of the eddies where the chute joins the channel below Island No. 35. Boys, I've seen big tree trunks caught in the whirlpools, stickin' up 10 feet out of the water and spinnin' round like a top."

"If you're smart, you'll cut in close to the east bank at Mile 883 (above Head of Passes), where the short cut comes out from behind the towhead and against the bank. That place is always mean, and if you hit it right after a big boat has gone by, it'll tear them gol-durned tanks right off your bottom like they was only glued there!"

"Yeah?" was Dick's answer to this gloomy forecast.

"Sez you!" Tommy added.

The boys had bolted up the steel straps which held the oil drums in place and took the remark as a reflection on their work.

Much to Tom's disgust, I really worried over the eddies.

"Oh, let him worry," said Dick. "Dad's our official worrier, and it isn't costing us anything."

Before noon on July 11, as we neared Marr Towhead, Tom was steering, Tommy and I preparing lunch, and Dick navigating.

Tom saw the smoke of a steamer ahead and, thinking the tug would hold to the channel, proposed to cut back of the towhead. The water appeared to be open in the cutoff, but, vividly remembering our experience of going aground, Tom asked Dick to take soundings.

Presently the water became too shallow for safety, and Tom turned back and resumed the main channel. The big tugboat, pushing

Staff Photographer J. Baylor Roberts

A Weirdly Eroded Loess Bluff, Festooned in Moss, Overlooks the River above Natchez

A deposit of wind-blown silt, the cliff forms a natural levee from Vicksburg almost to Baton Rouge. Across from it, the flat Louisiana bank has to be diked up. Here a towboat heads into Giles Cutoff, an artificial channel which has shortened the Mississippi 11 miles by eliminating Marengo Bend (left). Lately, both ends of the bend have silted up, forming an oxbow lake.

Webb from Standard Oil Co.

"Big Mamma's" 37-foot Wheel Spanks the Mississippi. An Engineer Checks Her Bearings

Sprague, largest of towboats, began her career in 1902. During a flood she rescued a levee load of despairing people. Once she pushed a tow of 56 coal boats, a 7-acre unit longer than the *Queen Mary*. Entering the oil trade, she became known as the "only pipe line running lengthwise of the Mississippi." Now she is prepared to turn over her job to younger, twin-screw Diesel craft. Her whistle, willed to a new passenger vessel, will keep her memory fresh. In a narrow channel "Big Mamma's" cascade of water almost swamped *Meanco* (page 572).

eight barges, had turned and was proceeding up the chute. I brought the glasses to bear on the big stern-wheeler, thinking it might be the *Sprague*. But it was the *Jason,* throwing a beautiful waterfall from the paddle wheel.

As we cleared the towhead we saw another tug with barges approaching, and we faced the double problem of dodging the wash from the *Jason* while passing the second tug. I really started to worry in earnest.

For one thing, there were bluffs at the bend, indicating deep water and swift current. At this point the main channel and the cutoff chute reunited. That might be tricky. And a big boat had just passed. Suddenly the circumstances struck me as familiar.

Caught at Mile 883

"Dick," I yelled to our navigator of the moment, "what mile are we?"

"We just cleared Point Pleasant Mud Light a minute ago," he replied. "Mile 884.2. By

Rex E. Hieronymus

Three Vagabond Raftsmen Perch on a Navigation Marker

Crescent Light, on the Louisiana shore, is typical of hundreds maintained along the Mississippi, more than one to each mile. By keeping his sights lined up on a light, a pilot sticks to the main channel at night. Here the figure 147.8 refers to the number of miles above Head of Passes, where, 95 miles below New Orleans, the Mississippi splits into three mouths.

the way, Dad, here's a note on the margin in your handwriting—'Look out for the eddies at Mile 883.'"

Anxiously I went forward with Tom, scanning the surface of the water ahead.

"Tom, I don't like the looks of this. The water's still rough from the *Jason* and we're channeled by that other tug. Look at that water out there." I pointed to the churning current. "This is Mile 883, you know, where that pilot said it was treacherous."

Tom scanned the river. "Nothing to it," he replied. "It's just a little choppy from the *Jason* and the wind."

Indeed, it didn't look too formidable. I turned to get on with lunch. Suddenly Tom let out a frantic yell.

"Look out!" he shouted. "Hang on, everybody!"

As I turned to look for the cause of his warning, the raft gave a wild lurch and the only thing I could see was a sheet of water coming chest-high at Tom as he stood at the helm.

As it struck, I was thrown to my knees, waist-deep in water. Our lovely lunch, pan and all, went overboard, and a miscellaneous assortment of deck chairs, pike poles, and gear swirled around me.

We pitched like a cork in a washing machine as wave after wave broke over the deck, and we reared and came down on each crest as if we were hitting bottom. Water can be pretty hard when a big chunk of it hits a couple tons of raft.

Again we were lucky, for, though everything was thoroughly soaked and our lunch lost, no damage had been done. In a minute we were on an even keel again, and Tom was quartering the stern waves of the passing tug.

Instead of cutting the motor and drifting during lunch as we usually did, we tied up at a sandy, pleasant spot shown on the map with frank ambiguity as "Riddles Point or Ruddles Point" and rustled up a campfire.

Meanco Clears the Halfway Mark

The potatoes, which had been baking in the stove, had come through safely. In addition, we broiled about a dozen wieners over the fire and sandwiched them in buns, added a can of corn, tomato salad, coffee and milk, and dessert of fresh oranges Waldorf. A light lunch!

At 3:45 on July 12 we cleared Gold Dust

Bar Light at Mile 796.9—halfway mark of our trip. The crew cheered, albeit a bit weakly, for in all four minds was the thought that half of our voyage was done.

As the days and the miles dropped behind, we took time out occasionally for relaxation and sight-seeing ashore, pausing at Memphis, Helena, and Greenville.*

We spent an afternoon tramping over the battlefield at Vicksburg, and visited the U. S. Waterways Experiment Station, of the U. S. Army Engineers, near by. Here are made the models of the Mississippi used in the study of flood control.†

At Baton Rouge we received mail from home and went through the Louisiana State Capitol.

Near Mile 675 we moored for the night in OK Bend, near the fishing camp of a soft-spoken Englishman named Avery Thomason. At Evan Hall Landing, Mile 178.5, we stopped near Carl Arnt's extensive fishing establishment. One had heard of us on the radio, the other had read about us in the Donaldsonville, Louisiana, weekly; both came over to our mooring for a visit and pressed us to stay with them for a few days.

Rex E. Hieronymus

It's Dick's Turn to Cook; He Plucks a Fowl

Appetites never flagged aboard *Meanco*. She had many of the comforts of a kitchen, including an icebox. Motor exhaust gases heated the galley stove. Campfire and gasoline stove did the work ashore. Here the raft appears off Donaldsonville, Louisiana.

Gifts of Chicken "Fresh off the Hoof"

Though their habitations were modest, they were fine, hospitable gentlemen who made us gifts of catfish and chickens, "fresh off the hoof," and wished us well.

Mr. Thomason showed us several duckbill cats he had caught. This is the American paddlefish (*Polyodon spathula*), not a catfish at all. The beak end of this odd-looking creature, a wide spoon bill about one-half as long as the main body, looks like one of Nature's mistakes.

"The mandible resembles that of the Australian platypus," Mr. Thomason explained, by way of apology no doubt.‡

"It's the strangest-looking thing I've ever seen in my life," I said.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Highlights of the Volunteer State," by Leonard C. Roy, May, 1939; "Arkansas Rolls Up Its Sleeves," by Frederick Simpich, September, 1946; and "Machines Come to Mississippi," by J. R. Hildebrand, September, 1937.

† See, in the NATIONAL GEOGRAPHIC MAGAZINE, by Frederick Simpich, "Great Mississippi Flood of 1927," September, 1927; and "Men Against the Rivers," June, 1937.

‡ See "Australia's Patchwork Creature, the Platypus," by Charles H. Holmes, NATIONAL GEOGRAPHIC MAGAZINE, August, 1939.

Brandon Road Lock at Joliet, Illinois, Lifts Gulf-to-Chicago Barges 34 Feet

Only flatlands separate Mississippi and St. Lawrence drainage areas. The canalized Illinois Waterway, emptying Lake Michigan water into the Mississippi, unites them. Here the Des Plaines forms part of that system.

© Chicago Aerial Survey Co.

Water in the Turning Basin Backs Up above Town Before Cascading over the Spillway

By impounding water, in drought times the dam helps maintain a 9-foot channel the year round. During wartime this waterway floated Lakes-built warcraft Gulfward. *Meanco* passed through the 600-foot lock.

The duckbill cat, limp in my hands, seemed to cast a reproachful eye at me. Just then Mr. Thomason's gaze wandered to the *Meanco*. Both Mr. Platypus and Mr. Thomason very likely were thinking the same thing about the *Meanco,* but if so, each was too polite to mention it.

We nosed upstream a few miles into some of the tributary streams: the St. Francis, the White (which Dick and I had fished in the Ozarks), the Arkansas, and the Atchafalaya, that river with the unpronounceable name, which doesn't know whether to flow downstream or upstream, toward the Mississippi or away from it.

On the afternoon of July 21 we went into the upper end of Deer Park Bend at Mile 342 for our night mooring. This bayou used to be a huge bend or loop in the main channel. In 1933 a cutoff was dredged across the neck of the bend, shortening the sailing channel about 13 miles. This artificial short cut, Glasscock Cutoff, is about four miles long and rather narrow.

Next morning we re-entered the main river about 9 o'clock and started down the cutoff. It was raining lightly and the visibility was about a mile. A half-mile into the cutoff we observed a big tow and barges approaching from downstream.

"She's a big one," said Tom.

"A stern-wheeler," I added.

"Pushing a big tow," Dick contributed.

"And she's coming pretty fast," Tommy finished.

Tom and I hastily consulted the chart and observed that the sailing line was shown to be toward the east bank. Presumably a big craft like this one would follow the official channel; we elected to pass her on our starboard side, as was proper. We proposed to split the difference and pass midway between the approaching vessel and our right bank.

The *Sprague*, at Last

As we approached, we saw that her wheel was as high as her third deck and was throwing a terrific cascade of water. We made the boys don their life preservers and placed ours near at hand.

Tom was at the wheel, and I stationed myself at the motor, to coax it along if it chose to malinger.

As we met the modest bow wave thrown out from the front barges of the long tow, we saw the name of the big stern-wheeler. It was the *Sprague*.

"One thousand miles in which to meet her, and here we are, dead upon her in a narrow channel!" I groaned.

Then her stern wave hit us. The *Meanco* pitched and rolled, with water pouring over her deck and the motor alternately groaning and screaming as the propeller was lifted clear of the water.

Tom at the wheel hopefully searched for quieter patches of water as we bucked waves six or seven feet high and water swept over our deck. Loose gear surged at the ties with which we now kept it secured. The boys, even on their perches atop the lockers, were drenched, but enjoying themselves hugely.

River Goes Hog-wild

Tom took the *Meanco* back and forth across the river, part of the time heading upstream, dodging the mountainous waves. But they didn't continue as orthodox waves; when the back action of the waves crashing the banks met the original sequence of crests, they weren't waves any more. The whole surface of the river went hog-wild, surging and churning as if possessed.

I clutched the rail with one hand and the throttle with the other, following Tom's signals to "open her wide" or to "hold her down." We both were so busy that we hardly got a look at the *Sprague*.

The river was rough for nearly an hour after her passing, but by midafternoon Tom and I had our vitals swallowed down where they belonged. Now we knew what the rivermen had been talking about when they warned us of the *Sprague*.

That afternoon I examined the charts and found that the cutoff where we met her, a quarter of a mile wide, is one of the narrowest places on the river between Cairo and the Gulf!

Later I checked on the size of the *Sprague*. Owned for more than 20 years by Standard Oil of New Jersey, she was built in Dubuque, Iowa, in 1902. Her paddle wheel is 37 feet in diameter and 40 feet wide, and her engines are 2,600 horsepower. She is the largest and most powerful stern-wheeler ever built for any inland waters (pages 559, 567).

By all who know her and her prodigious feats, she is affectionately called "Big Mamma." On an upstream trip she may shove as many as 10 big barges, the whole assembly actually exceeding the liner *Queen Mary* in length.

The *Sprague* does well to labor heartbreakingly at her tasks, because she is on her way out. Already many of her picturesque sister craft have gone to whatever port old steamboats go to, the junkyard most likely.

She is a symbol of passing splendor, for the Diesel men claim that a 2,000-horse-

power, twin-screw Diesel tug can outpull her. Inevitably, the Diesels will drive all the paddle-wheel boats from the river.

We met many of these Diesel tugs, and, while they are solid and impressive, they lack the grandeur and dimensions of the old twin-stack stern-wheelers, of which the *Sprague* is a lonely though majestic survivor.

After the experience with the *Sprague,* I never worried about meeting ocean-going vessels below Baton Rouge. Their waves might be higher, but they would be farther apart and there would be more room in which to avoid them.

Subsequently we did meet an ocean-going tanker below Baton Rouge. We figured her to be about 10,000 tons, though she was too far away for us to identify her.

She kicked up big waves, all right, but they were big in all dimensions—long, rolling, gentle waves, far enough apart to insure our craft against bridging them. We coasted gently down one wave, across the trough, then labored up the hill of the next.

Staff Photographer Robert F. Sisson

A Mississippi Relic Crumbles on the St. Louis Water Front

A sight of this vanished glory calls to mind the days when stately packets held challenge races on the river. They were celebrated for their fine food, watermelon parties, poker games, moonlight dances, and shipboard romances. Railroad competition drove them off the river. Now the 285-foot *Delta Queen* is preparing to revive old times with a Cincinnati-New Orleans schedule.

Tom, ensconced in the deck chair, feet on the rail, smiled a broad smile of approval of this elegant sensation.

"Here's the type of water this baby was made for," said he.

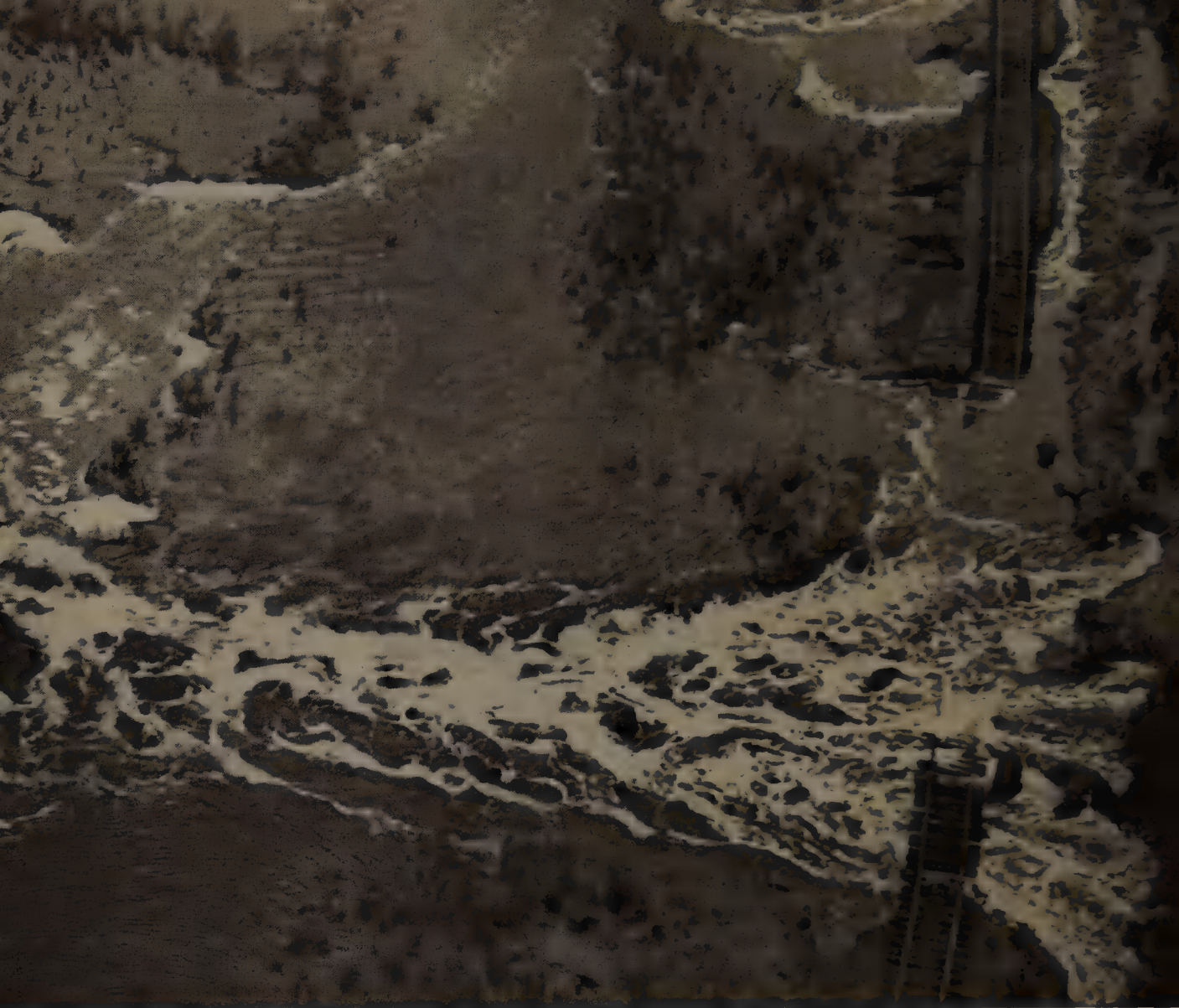
Last Night Aboard

Twenty-seven miles above New Orleans we passed our last night aboard. A mile below us a modern ocean tanker rode high at anchor off the Shell Oil Company's docks. After we had found our mooring, we cruised down to look her over, and as we sailed around her towering bulk, her officers invited us aboard.

They showed us all over the ship, the *Nïke,* out of Göteborg, Sweden, a 12,500-ton Diesel ship built in 1939. After our tour of inspection, her second officer and first engineer accompanied us down the ladder and aboard the *Meanco,* where they signed our map chart.

About noon on Friday, July 26, we passed under the great Huey P. Long Bridge and into the New Orleans harbor.* Our destination was the Allen Boat Co., where on Sunday the *Meanco* was to be offered for sale to the highest bidder.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Louisiana, Land of Perpetual Romance," by Ralph A. Graves, April, 1930; and "Louisiana Trades with the World," by Frederick Simpich, December, 1947.



AP from Press Ass'n

A Levee That Held a Bayou Breaks under the Punch of a Tropical Hurricane

With knowledge gained through research at U. S. Waterways Experiment Stations, the Army Corps of Engineers has tamed the Lower Mississippi so well that it has not experienced a main-line levee break in 21 years. However, tributary rivers still get out of hand at their mouths. This levee gave way when the September, 1947, hurricane struck New Orleans. A residential area east of the city was flooded.

About a mile from our destination Tom suddenly said:

"Rex, I'll bet we're making some sort of record, 1,400 miles on one shear pin!" (A shear pin acts as a mechanical fuse, giving way if the propeller strikes a snag, thus tending to prevent the propeller's breaking.)

I agreed that it probably would be a record.

Workmen on barges near the Allen Boat Co. saw us coming down the canal and stood up to wave and cheer our arrival.

"The Fleet's In!"

Each of us assumed his best nautical air as Tom brought *Meanco* smartly around to berth her in the slip.

About 200 feet from the dock, as we were trying to make a seamanlike finish to our journey, the engine suddenly went free and raced madly. Our speed slackened dismally as Dick jumped to kill the screaming motor.

Another mighty cheer, this time of the Bronx variety, went up from the men on the barges.

At the moment of our triumphal entry, the shear pin had given way!

Chagrined at this anticlimax, Tom and I installed a new pin, and at 2:20 p.m. the *Meanco* pulled into the dock. Journey's end at last.

"The fleet's in!" we wired our families.

Behind us lay 1,400 miles, nearly a month, of leisurely travel on the storied river. We were healthy and brown as Indians; none of us had had a minute's illness.

We had a treasury of memories of starry nights in the bayous and bright mornings on the murmurous river, of fun and excitement and companionship.

Most of all, Tom Roth and I treasure the companionship with our sons. We dare to hope that the boys will never think of the voyage of the *Meanco* without warm memories of their dads.

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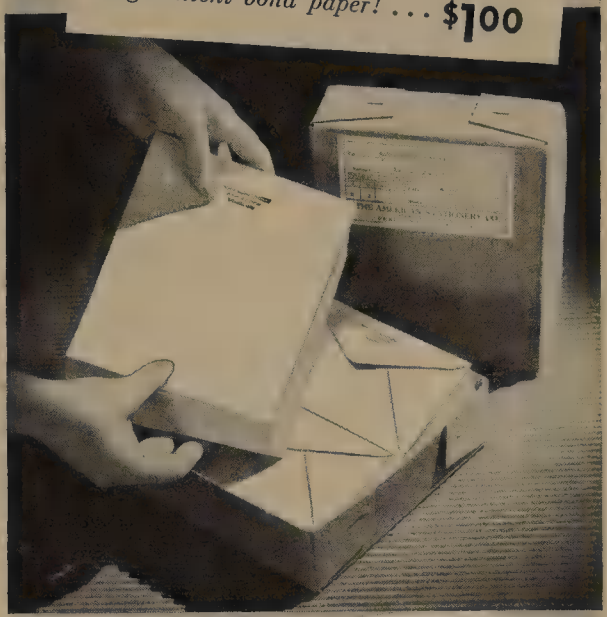

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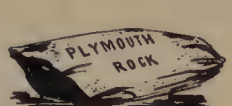

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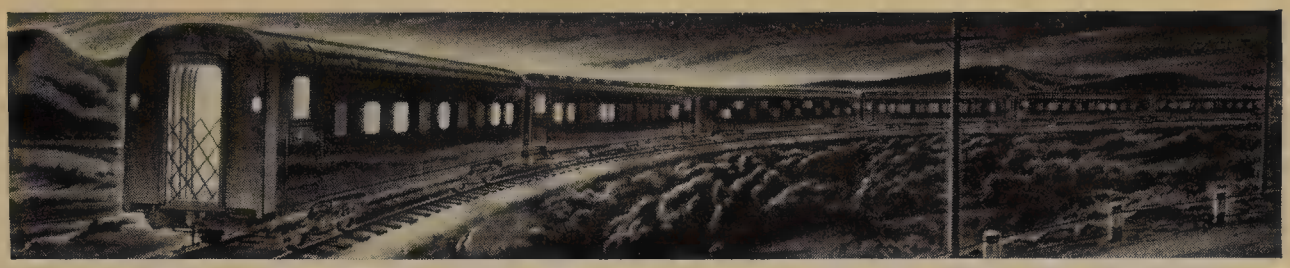

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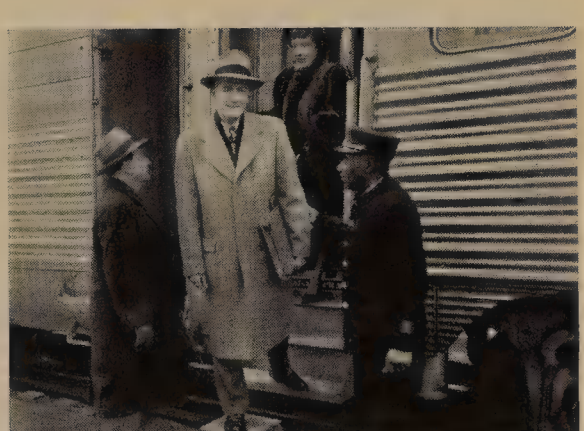

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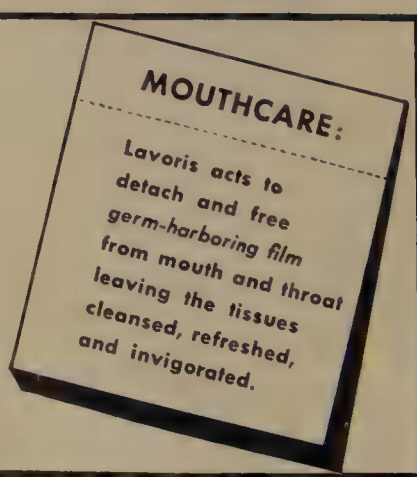
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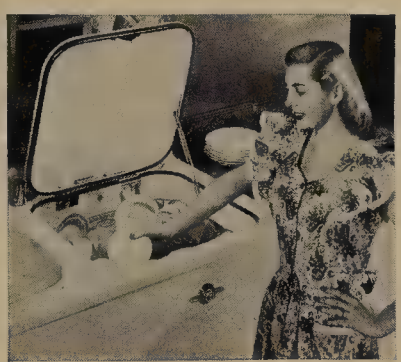

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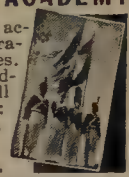

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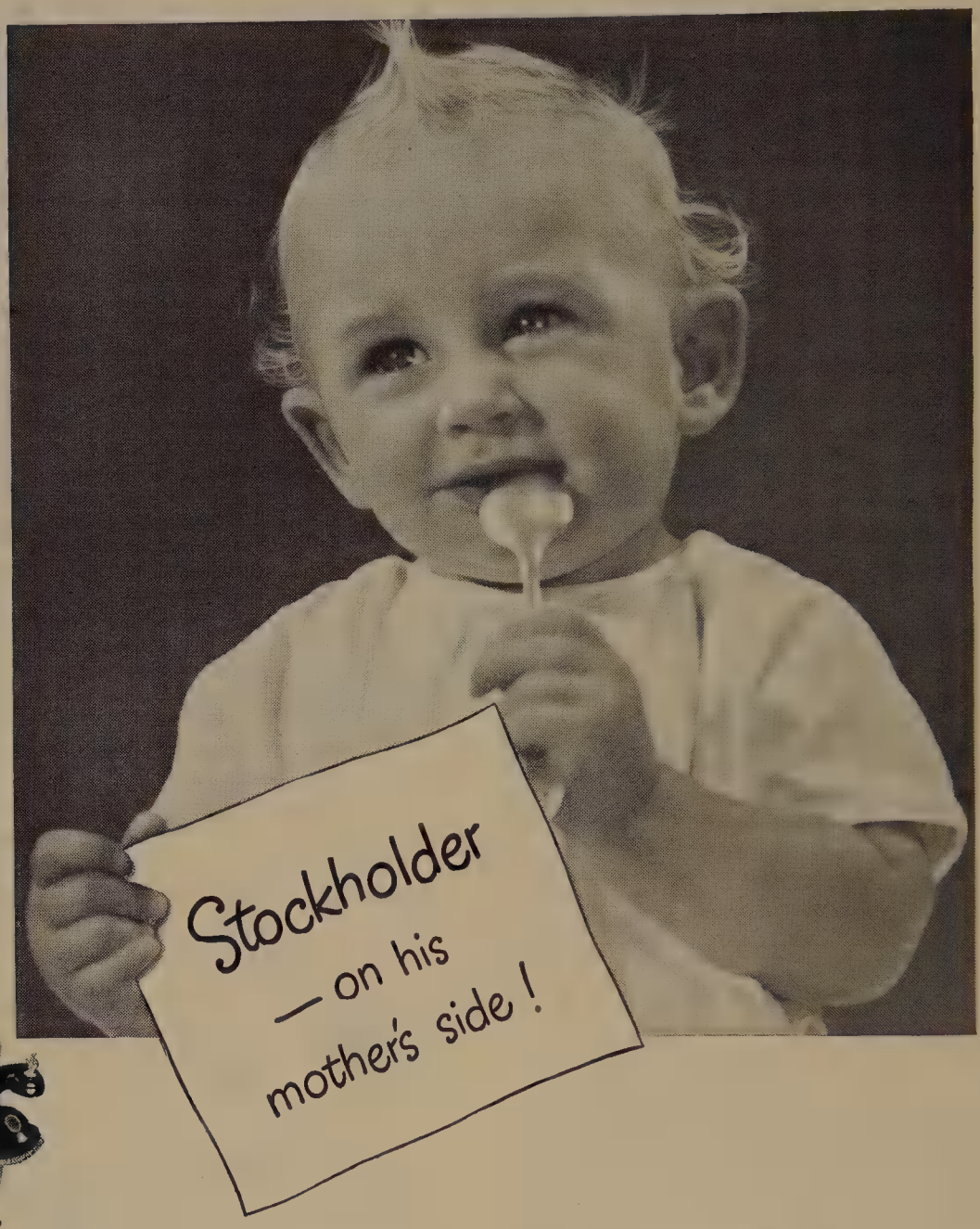

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Articles and photographs are desired. For material The Magazine uses, generous remuneration is made.

In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

The Society's notable expeditions have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic. By dating the ruins of the vast communal dwellings in that region, The Society's researches solved secrets that had puzzled historians for three hundred years.

In Mexico, The Society and the Smithsonian Institution, January 16, 1939, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 B. C. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

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The National Geographic Society-U. S. Army Air Forces Expedition, from a camp in southern Brazil, photographed and observed the solar eclipse of 1947. This was the seventh expedition of The Society to observe a total eclipse of the sun.

The Society cooperated with Dr. William Beebe in deep-sea explorations off Bermuda, during which a world record depth of 3,028 feet was attained.

The Society granted $25,000, and in addition $75,000 was given by individual members, to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California were thereby saved for the American people.

One of the world's largest icefields and glacial systems outside the polar regions was discovered in Alaska and Yukon by Bradford Washburn while exploring for The Society and the Harvard Institute of Exploration, 1938.

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Low-swung new look! Soft-sprung new ride!

HERE'S the newest and unquestionably the smartest convertible that wheels along today's streets and highways.

Low-swung and clean-lined, this eye-filling Studebaker introduces a refreshing new kind of sports car styling.

You would hardly expect anything less distinctive from the originator of the world's first real postwar automobile.

What you enjoy even more than this car's dramatic new styling, though, is its thrilling new engineering. There's so much soft-sprung, road-hugging weight beneath you in this Studebaker, it rides with a dream-like new sensation of ease and smoothness.

You've never experienced such deep-bedded, luxurious comfort in any of your motoring up to now.

New 1948 Studebaker Champion and Commander sedans and coupes vie with these convertibles for your attention.

There's a fabulously fine new version of Studebaker's special, extra-long-wheelbase Land Cruiser, too. See all these new thrill cars soon.

STUDEBAKER

First in style...first in vision...first by far with a postwar car

© Studebaker Corp'n,
South Bend 27, Ind., U.S.A.

Ah-h-h! what comfort..

on **El Capitan**
daily between
Chicago—California

You'll enjoy new travel comforts when you ride *El Capitan*—Santa Fe's all-chair-car (coach fare) transcontinental streamliner.

New reclining chairs, with new-style leg rests, are molded to actual body measurements for greater riding comfort.

Non-fogging windows give you a better view of the colorful Southwest through which *El Capitan* passes . . . a reading light is focused directly on your book or magazine . . . an ash tray is at your finger tips . . . and a uniformed Courier Nurse is ready to aid those requiring her capable and friendly service.

Famous Fred Harvey meals, of course, are served in new lunch counter-diners.

Yes! Now it's more fun than ever to ride on *El Capitan*—the 39¾-hour "economy special" streamliner between Chicago and Los Angeles.

SANTA FE SYSTEM LINES . . Serving the West and Southwest

T. B. Gallaher, General Passenger Traffic Manager, Chicago 4

THESE ARE THE BEST MONTHS TO VACATION IN *Southern California**

Dry subtropical climate (Southern California is the only place in the U. S. that has it) makes *every* month the best for a vacation here. Visit old Spanish missions, a magic Pacific isle, orange groves, movie and radioland... *any time.* Swim, ride, sail, play golf... most any day of the year. Vacation the way you like, when you like! *And*—each season offers its own vacation bonuses.

SUMMER—Swim, sail or fish the Pacific. Nap on white sands. Enjoy *cool* evenings. See horse races, open-air concerts, night spots.

FALL—Join the fun at the beach—and the trek to the desert. See rodeos, speedboat meets, annual harvest of dates and grapes.

WINTER—Relax at luxurious desert resorts. See the beautiful Tournament of Roses. Poinsettias, camellias in bloom. Horse races.

SPRING—Wade in wild flowers that blanket rolling hills. Soak up a worry-melting sun over beach, desert, mountains and valleys.

COME ANY TIME—Los Angeles County and all Southern California are *best* whenever you can get away. Send coupon for our big "What to Do and See" color booklet. When you arrive, call at the All-Year Club's Free Visitors' Bureau, 517 West 6th Street, Los Angeles, for many other vacation aids.

**America's 4-Season Vacationland*

ALL-YEAR CLUB OF SOUTHERN CALIFORNIA, LTD.

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No one should plan to move now to Southern California to live unless assured in advance of permanent housing.

—(Free Booklet—Mail Coupon Today)—

All-Year Club of Southern California, Div. 5-C
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Please send me your free vacation booklet "WHAT TO DO AND SEE IN SOUTHERN CALIFORNIA."

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*State*_____

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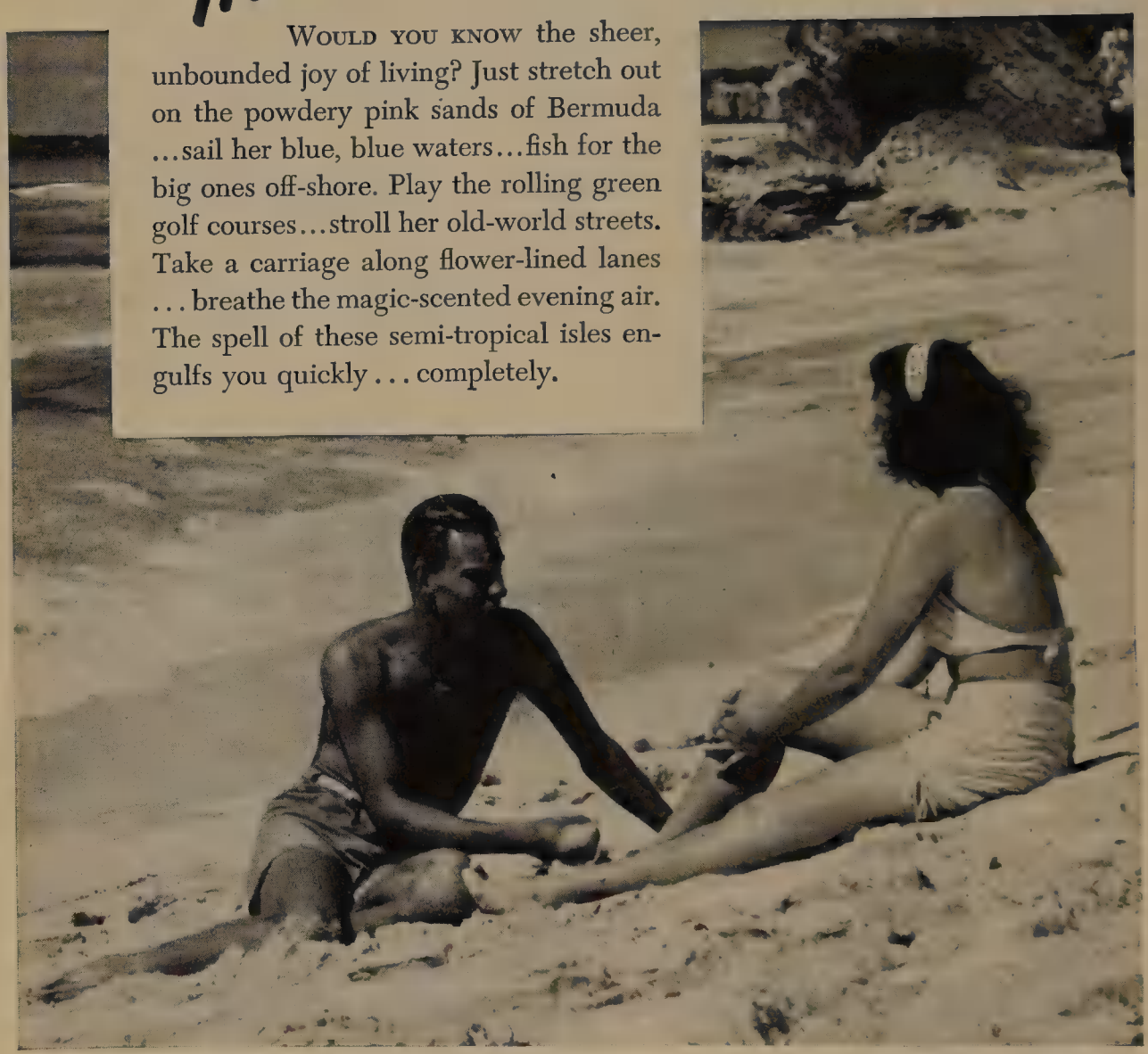
WOULD YOU KNOW the sheer, unbounded joy of living? Just stretch out on the powdery pink sands of Bermuda ...sail her blue, blue waters...fish for the big ones off-shore. Play the rolling green golf courses...stroll her old-world streets. Take a carriage along flower-lined lanes ... breathe the magic-scented evening air. The spell of these semi-tropical isles engulfs you quickly ... completely.



Bathing, South Shore

YOU CAN COME to Bermuda swiftly by plane ... or leisurely by boat. There is an ample choice of fine hotel and guest house accommodations, but advance reservations will assure you what you want. In planning your trip to Bermuda, your Travel Agent will give you experienced help and complete service—at no cost to you.

EVERYTHING IS BETTER IN

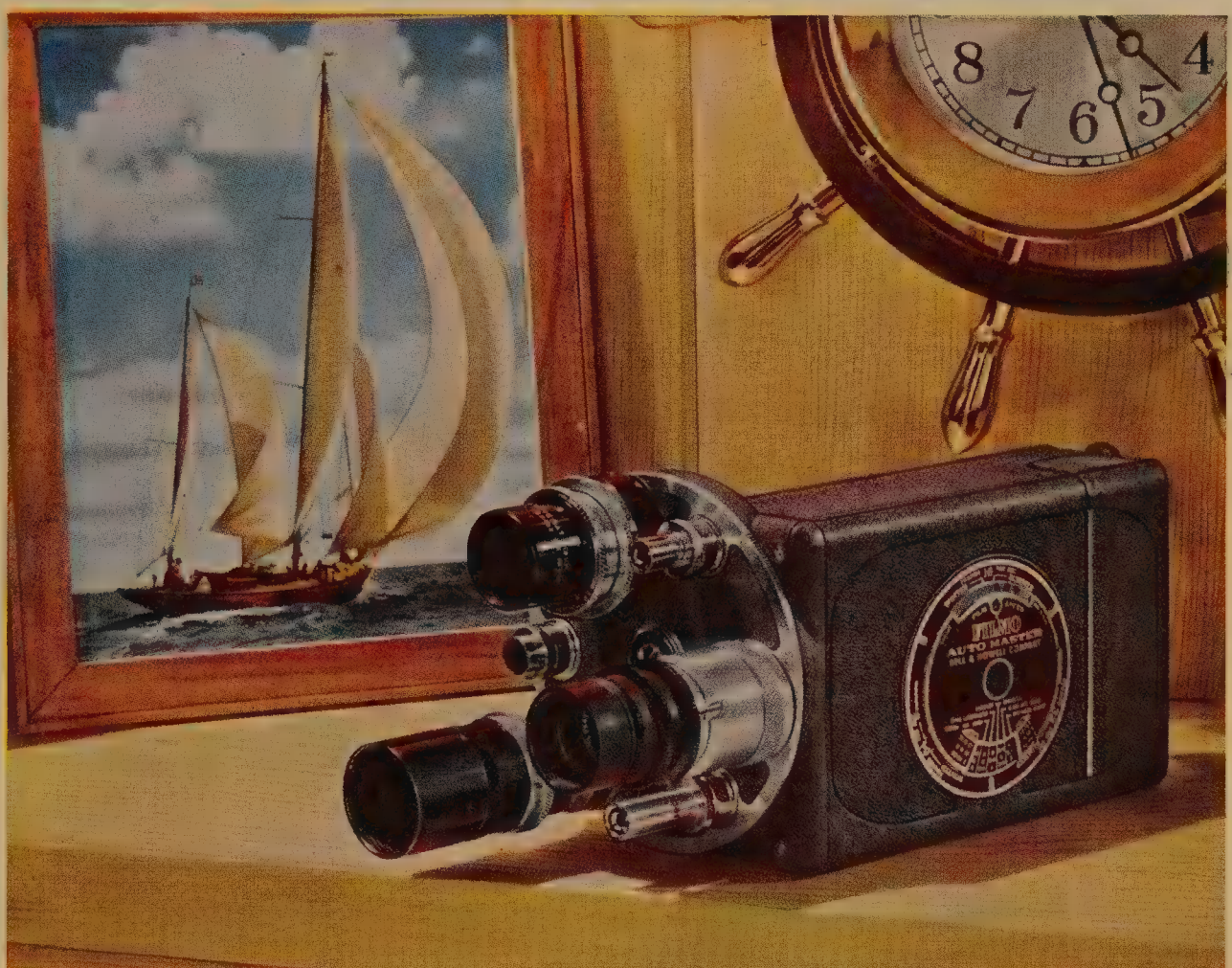
Bermuda

FOR NEW ILLUSTRATED BOOKLET, *write The Bermuda Trade Development Board, Hamilton, Bermuda, or 620 Fifth Avenue, New York 20, N.Y.*

Both are Bluebloods . . .

EDLU II, swift ocean racing yawl owned by Mr. R. J. Schaefer, Brooklyn, N. Y.; designed by Sparkman & Stephens.

FILMO AUTO MASTER, the only 16mm magazine-loading camera with a turret head. Makes three lenses instantly available. Takes the finest personal movies in true natural color or sparkling black-and-white.



FOR Movies

YOU'LL BE PROUD

TO SHOW

If you thrill to a racing yacht's perfection of line and performance, then you'll thrill to the champion of movie cameras . . . a Filmo. Press a Filmo starting button . . . the soft, steady purr says you'll show *this* film with pride—in *any* company. You can expect theater quality in Filmo movies, for Filmos fully reflect Bell & Howell's 41 years of experience in building Hollywood's preferred professional equipment. Filmo "bluebloods" include 8mm and 16mm cameras and projectors, and 16mm sound film projectors. For full information see your dealer or write Bell & Howell Company, 7104 McCormick Road, Chicago 45, Illinois.

FILMO AUTO MASTER

by

Bell & Howell

Ever watch a Miracle in the Making?

WATCH A FREIGHT TRAIN pounding past and you'll see a miracle in the making—the miracle of American mass production.

For it is the mass transportation provided by freight trains which makes the miracle of mass production possible. Every day 20,000 of these workaday freights shuttle food, fuel, and raw materials to and from the four corners of the country. From the nation's industrial plants they fan out in all directions to supply America with a sparkling variety of goods.

The job these freight trains do staggers the imagination. They carry a traffic equivalent to moving more than a million tons of freight a mile every minute of the day and night.

In doing this, the railroads today are paying wages and prices for the things they buy which average 75 per cent higher than before the war...while the average pay they get for hauling a ton of freight one mile has gone up less than half that much.

So the next time you see a freight train pounding past, remember that in order to keep on providing the low-cost mass transportation on which the miracle of American mass production depends, railroads must be allowed to earn enough to keep their plant and equipment abreast of the needs of the nation.

ASSOCIATION OF AMERICAN RAILROADS

WASHINGTON 6, D. C.

Canadian Pacific took me
TO CANADA'S WESTERN WONDERLAND!

IN MY COZY, Canadian Pacific-designed berth, I rode in perfect comfort. Canada's Rockies... the scenery all the way to Victoria, British Columbia... take your breath away, but your appetite *never*... the food on Canadian Pacific trains is so good!

...ON MY STOP-OVER AT THE EMPRESS, I sailed, swam, played tennis and golf, fished for salmon and trout, shopped for English bone china and fine woolens. Even had time to relax and enjoy the acres of velvet lawn and the roses that are as famous as the English country-house atmosphere of this Canadian Pacific hotel.

ALASKA BECKONED, so Canadian Pacific arranged a side-trip...reserved me space on one of their Princess liners that sail up the sheltered Inside Passage. A sight-seer's paradise of sparkling water, incredible flowers, fiords, totem poles.

THIS YEAR, my husband and I are honeymooning at the Empress, and you can be sure Canadian Pacific will go out of their way to take care of us in every way...to and from the Pacific Coast. It's this special service that has made Canadian Pacific the world's most gracious travel system.

Canadian Pacific

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Ask Canadian Pacific or your local agent about hotel, steamship or rail reservations.

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It's Sculpture in Silver...
It's Wallace Sterling...

STRADIVARI . . . inspired by the genius and mystery in the art of the great master. Like the classic forms of sculpture, STRADIVARI has "Third Dimension Beauty" . . . loveliness in front, in profile, in back . . . the quality of silvercrafting found only in Wallace Sterling. Other "Third Dimension Beauty" designs include Grand Colonial, Rose Point, Sir Christopher, Grande Baroque. Six-piece place settings from $27 to $35, according to pattern.

Send 25¢ for the book, "Beauty Moods in Silver," by William S. Warren, designer of Wallace's "Third Dimension Beauty" patterns. We will also include the booklet, "Daily Pleasure in Sterling," which contains ideas on entertaining, and table settings arranged by noted magazine editors. Address Dept. N2, Wallace Silversmiths, Wallingford, Conn.

WALLACE
STERLING

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You can start living better...and cheaper when you own a General Electric Home Freezer!

1. First, the remarkable 8-cu-ft G-E Home Freezer holds 280 pounds of fresh, delicious foods at zero degree.

2. You can freeze and store steaks, lamb, fresh fish, and many other foods—and always have them on hand.

3. You don't have to shop when the weather's bad . . . when the children are out of sorts . . . or you've a headache.

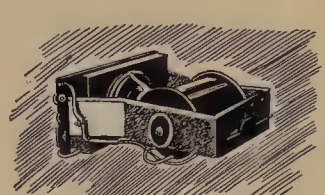
4. You can get dinner ready—or feed unexpected guests—on short notice. Your fresh food is right at your elbow.

5. That fine game and fish need not be eaten at once. You can keep them for special occasions, in your freezer.

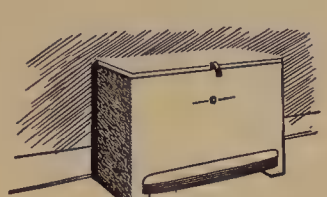
6. You buy choice beef, lamb, and other meats at "sale" prices . . . keep them for months when prices are higher.

7. You can preserve the modern way. No more hot stove. Just blanch vegetables, seal them in containers, and *freeze.*

8. The Freezer to buy is the *General Electric.* It has the same sealed-in refrigerating system as in G-E Refrigerators.



9. 1,700,000 of these dependable refrigerating systems have been in service in G-E Refrigerators 10 years or longer.



10. General Electric has *Perfect Seal* construction that assures uniform temperature throughout the cabinet.

11. The General Electric Home Freezer, we think you will agree after you make comparisons, is your *best* buy!

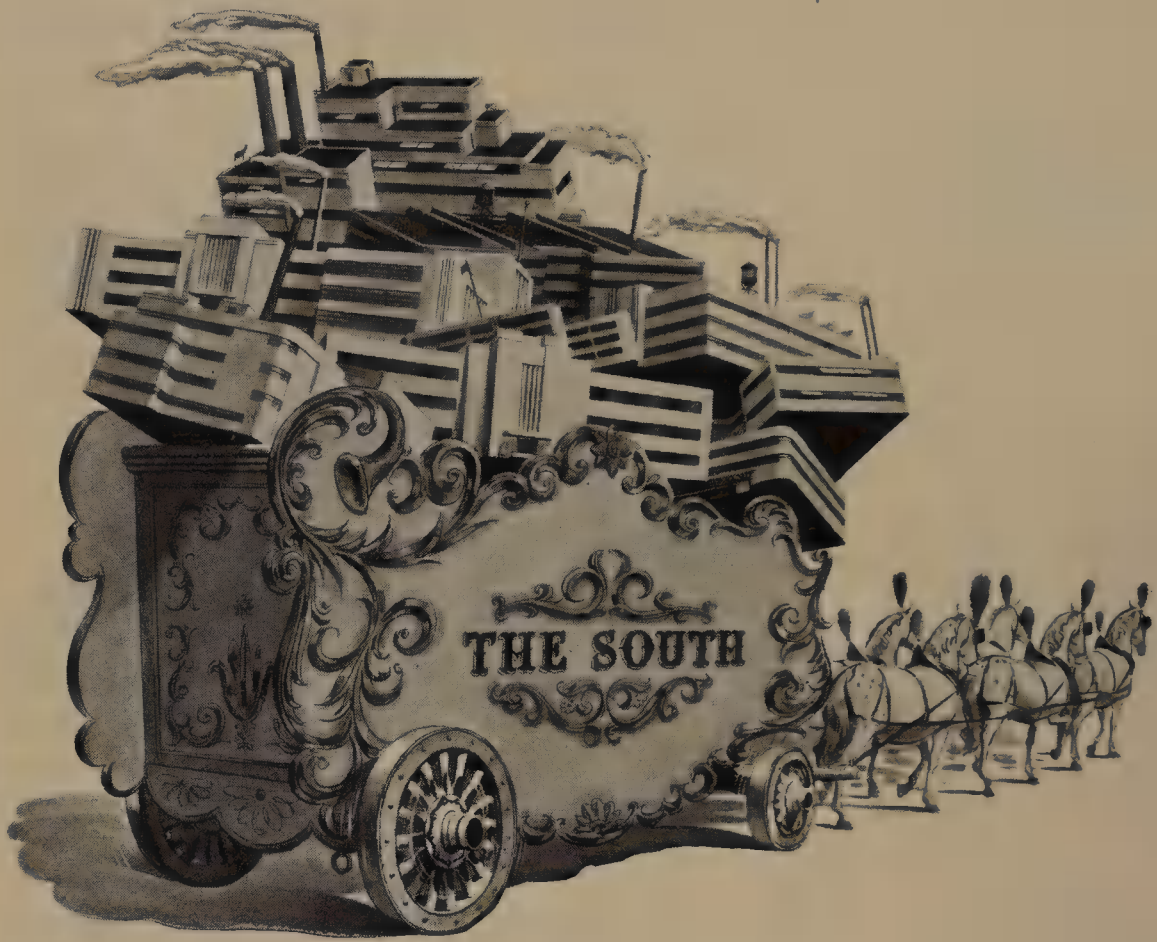
General Electric Home Freezers

For *quick-freezing*

For *storing* frozen foods

General Electric Company
Bridgeport 2, Conn.

GENERAL ELECTRIC



Industrial Bandwagon

SOON, the greatest industrial show on earth will be "playing" in the South!

For this progressive, fast-growing area . . . served by the 8,000-mile Southern Railway System . . . is a land of gargantuan opportunities. Here, new factories are springing up almost as fast as the "big-top" the night before a circus. Here, both old and new plants are growing to jumbo size . . . and prospering . . . thanks to a colossal list of natural and economic advantages.

So step right up! Hop aboard this industrial bandwagon! For a brighter business future . . . "*Look Ahead—Look South!*"

Ernest E. Norris
President

SOUTHERN RAILWAY SYSTEM

The Southern Serves the South

ONLY AN Elgin

HAS THE DURAPOWER MAINSPRING*

MADE OF "ELGILOY" METAL

Eliminates 99% of watch repairs due to steel mainspring failures!

LOOK FOR THIS SYMBOL ON THE DIAL

The one you love will be happier with an ELGIN

The powerhouse of a watch is the mainspring. And, there in that part, Elgin offers a tremendous advantage.

Elgin's DuraPower Mainspring *completely* overcomes rust—the commonest cause of mainspring breakage. *Retains* its "springiness" indefinitely for greater accuracy through the years. *Actually eliminates 99% of watch repairs due to steel mainspring failures!*

This exclusive DuraPower Mainspring is in all new Elgins at no extra cost.

You know of Elgin's famed timed-to-the-stars accuracy. You can see Elgin's brilliantly original styling. And you can appreciate the importance of having a watch that's made in America, adjusted here both to temperatures and positions.

Now the "dp" symbol of DuraPower on the dial of every Elgin is a final assurance that you will be happier with an Elgin Watch.

Lord and Lady Elgins are priced from $65.00 to $5000. Elgin De Luxe from $47.50 to $100.00. Other Elgins as low as $29.75. All prices include Federal Tax.

• • •

Now to Elgin's famous star-timed accuracy the DuraPower Mainspring adds a permanency of time-keeping performance never before possible in any watch. Elgin observatory time is the official time of United Air Lines.

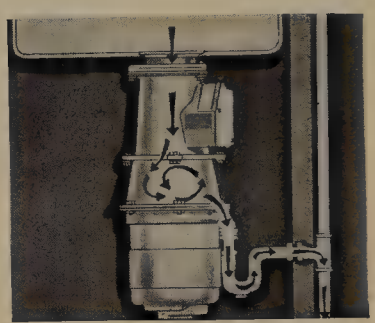
*Patent pending

Garbage nuisance ended by new kitchen appliance that shreds food waste and washes it down the drain.

Picture *your* home—rid forever of garbage.

Picture the ease, convenience and cleanliness—with all food waste disposed of *electrically*, right down the sink drain.

Make yours the most modern, most sanitary of kitchens. Install the amazing new General Electric Disposall*—and forget you ever heard of garbage!



1. A simple appliance, hiding under and fitting most any sink. The Disposall has capacity enough for an average family's food waste from any one meal.

2. Once all food waste, even rinds and bones, is scraped into drain, you lock protecting sink drain cover. Clean, flushing water enters opening in cover!

3. Disposall starts automatically as cold water is turned on. The food waste is shredded into tiny particles, and flushed into sewer or septic tank.

4. We can hear you now, agreeing with other Disposall users who say: "It's one kitchen appliance I'd never give up." "So clean . . . so sanitary." "Great invention!"

DISPOSALL

DISPOSALL MEANS GOOD-BY TO GARBAGE AUTOMATICALLY!

*General Electric's registered trademark for its food-waste appliance.

For the perfect laborsaving combination, the Disposall can be teamed up with a General Electric Dishwasher in a complete Electric Sink! General Electric Company, Bridgeport 2, Conn.

GENERAL ELECTRIC

The high cost of living has us walking a tightrope too

The high cost of living is another name for inflation. It hurts us just where it hurts you—in the pocketbook. For when prices are too high, fewer people buy.

We are doing everything we can to keep our prices *down* and quality *up*. To this end, key men from all our companies meet at a round table once every month. They study the best results of National Dairy operations . . . pool brains and experience . . . to bring you *top quality at lowest possible price.*

Here are some figures which show how milk prices compare with food prices, from 1939 to 1947:

Increase in cost of food 106%

Increase in cost of fluid milk . . . 63%

Notice that milk has not increased nearly so much as the average of other foods. Our profit from all of our milk divisions averaged less than ½ cent per quart of milk sold in 1947—far less than the public thinks business makes—and much less than the average profit in the food industry.

Milk—nature's most nearly perfect food—gives you more for your money than anything else you can eat. Our research guards the quality of milk—and cheese, butter, ice cream and other products made from milk—to keep nutrition and flavor at highest levels. Then we make these foods *available at the lowest possible prices to the greatest number of people.*

An impartial national survey shows that most Americans consider 10%-15% on sales a fair profit for business. Compared to this, the average profit in the food industry is less than 5%. And National Dairy's profit in its milk divisions in 1947 was less than 2%.

NATIONAL DAIRY PRODUCTS CORPORATION

MAINE GIVES YOU MORE

Come to Maine this summer with all your family for a great vacation outdoors—sailing, fishing at sea or in fresh water, hiking through picturesque seaports, resting in the mellow summer sun, sleeping soundly through cool pine-scented nights. You'll like Maine's friendly hospitable people, you'll revel in Maine's magnificent scenery, and how you'll relish Maine's matchless foods —come to Maine for a full-measure vacation.

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- *Available only through those who render professional or technical ophthalmic services.*

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COMPANY

RCA scientists—pioneers in radio-electronics—apply the "radio tube" to communications, science, industry, entertainment, and transportation.

This "magic lamp" makes Aladdin's look lazy

You will remember the fabulous lamp—and how it served its master, Aladdin. Serving you, today, is a real "magic lamp" . . . the electron tube.

You are familiar with these tubes in your radio, Victrola radio-phonograph or television set . . . but that is only a small part of the work they do. Using radio tubes, RCA Laboratories have helped to develop many new and useful servants for man.

A partial list includes: all-electronic television, FM radio, portable radios, the electron microscope, radio-heat, radar, Shoran, Teleran, and countless special "tools" for science, communications and commerce.

The electron microscope magnifies bacteria more than 100,000 diameters to help fight disease, radar sees through fog and darkness, all-electronic television shows events taking place at a distance, radio-heat "glues" wood or plastics, Shoran locates points on the earth's surface with unbelievable accuracy, Teleran adds to the safety of air travel.

Advances in radio-electronics are a major objective at RCA Laboratories. Fully developed, they are part of the instruments bearing the name RCA, or RCA Victor.

When in Radio City, New York, be sure to see the radio, television and electronic wonders at RCA Exhibition Hall, 36 West 49th Street. Free admission. Radio Corporation of America, RCA Building, Radio City, N. Y. 20.

RCA **RADIO CORPORATION of AMERICA**

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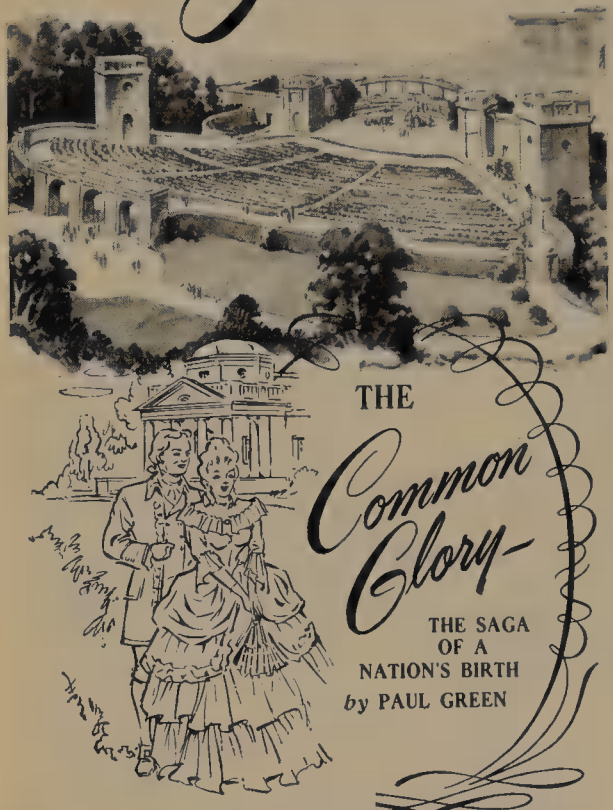
Presents



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by PAUL GREEN

AT HISTORIC WILLIAMSBURG

JULY 2—SEPTEMBER 6

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the AMPRO Imperial

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Most important — you get longer, more satisfactory service. Ampro projectors embody many exclusive advanced features that make for better projection. If you want to see how much difference Ampro extra quality can make with your pictures—ask your dealer to demonstrate on Ampro today!

Send for Free Circular

on Ampro "Imperial" 16mm. Silent Projector with details and prices. If you are interested in sound motion pictures, send 10c for 16-page booklet, "The Amazing Story of Sound Motion Pictures." Dramatically illustrates how sound films [redacted] made.

Ampro Corporation
Chicago 18, Ill.
A General Precision Equipment Corporation Subsidiary

AMPRO CORPORATION
2835 N. Western Ave., Chicago 18, Ill.

Please send me free circular giving full details on the Ampro "Imperial" 16mm. Silent Projector. I enclose 10c ☐ for ■ copy of the illustrated booklet, "The Amazing Story of Sound Motion Pictures."

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ur Canada's scenic highways — stop a ile at inviting cabin colonies.

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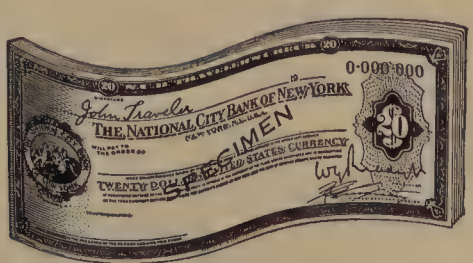

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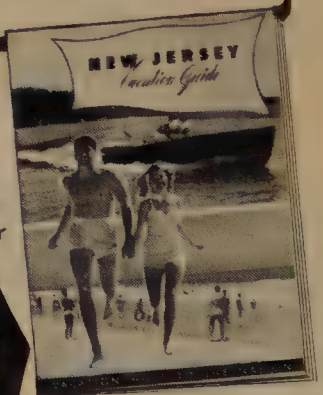

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Model 48L11 . . . same as above but battery operated only. A best buy at $19.95

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the meter with [redacted] MEMORY
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SET . . . just line up trident over pointer. A twirl with one finger does it.

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The time is now!

Children grow up so quickly. Before you know it, their childhood days are but memories—unless you've captured and preserved them . . . in true-to-life color *movies*.

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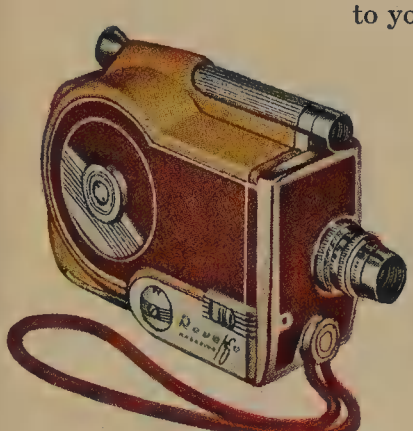

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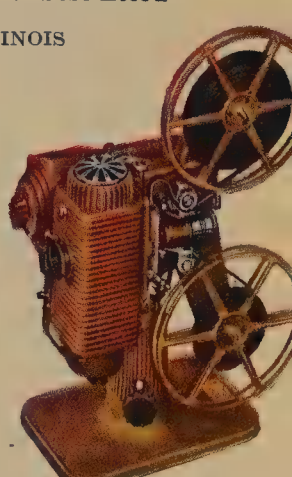

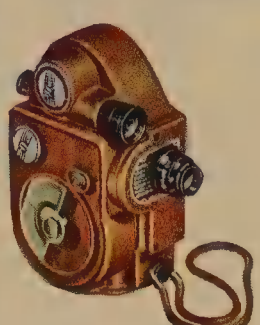

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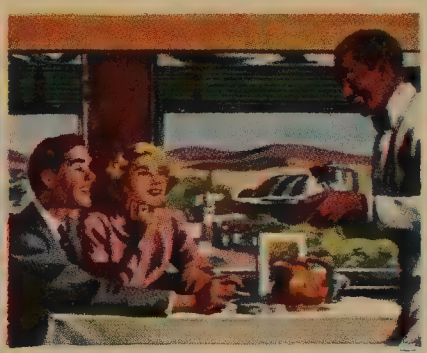

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So easy to pack or carry, you'll keep it with you constantly. Weighs only 5½ lbs.—yet it's powerful in volume—rich in tone. Plays on self-contained batteries or on AC or DC current. Built-in Wavemagnet. Maroon, white or black plastic case, gleaming Roman Gold grille.

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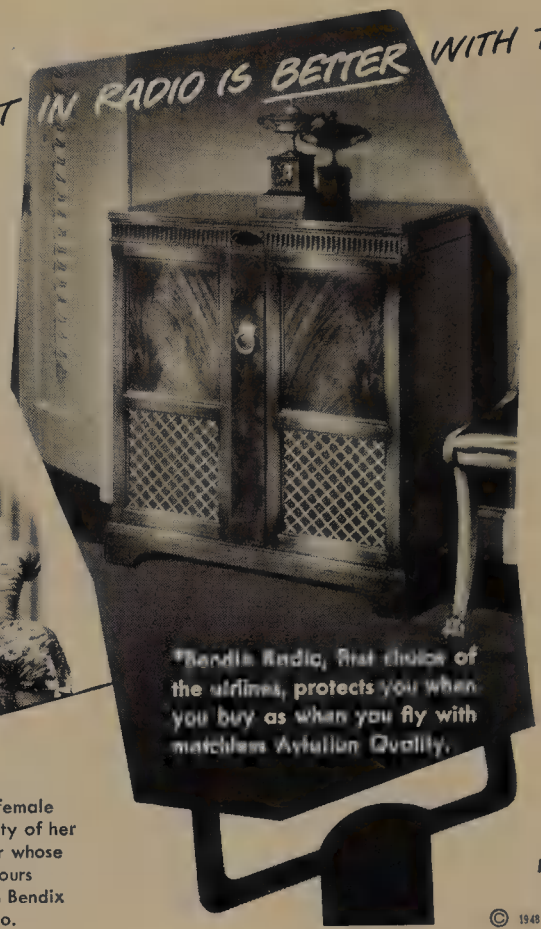

To know truly fine radio-phonograph performance, see and hear this beautifully styled, meticulously engineered instrument, with exclusive Bendix Hush-O-Matic, Ratio-Detector FM, Swing-A-Door, and Aviation Quality*. Model 1524 is sold by better dealers everywhere.

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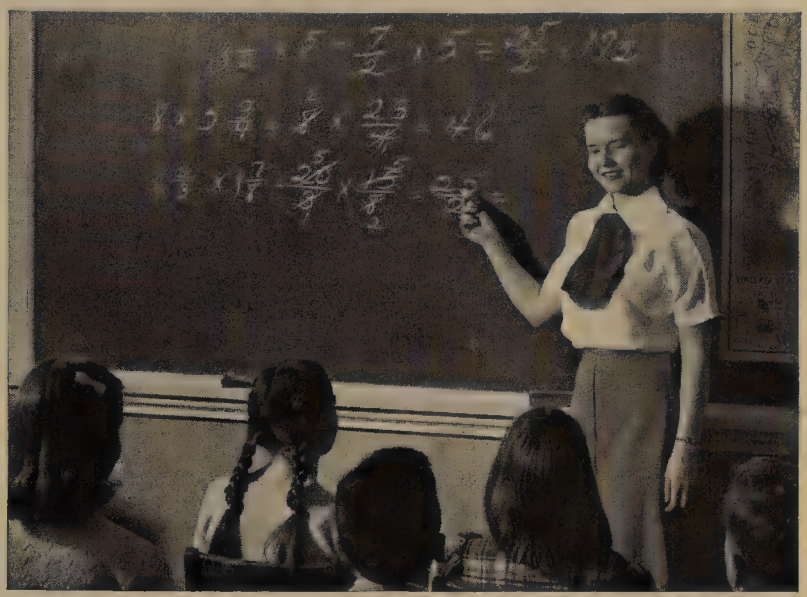
Facts and Fallacies about Seeing

Are schoolteachers' eyes better than yours?

NO, not necessarily. But a teacher acquires unusual seeing ability. She must keep an entire schoolroom under constant observation. Her eyes must adjust themselves frequently from reading a book or paper close at hand to a blackboard or wall map at some distance. And all the while she must watch the behavior of 30 or more active youngsters. Teachers who render such important service in the education of our children owe their seeing ability not to "better eyes," but to the fact that their vision is developed through training and experience in meeting a unique "seeing situation."



Will glasses alone improve your eyesight?

NO! You too, like the teacher, should have seeing ability to meet your visual requirements. As in the case of some teachers, you may not be able to achieve this unaided. The only way for anyone to make sure is to seek professional guidance. Important as glasses are, their aid to your visual comfort and efficiency depends upon the professional services and technical skills of your Optometrist, Ophthalmologist, Ophthalmic Dispenser (Optician).

EXAMINATION

Seek professional advice not glasses at a price

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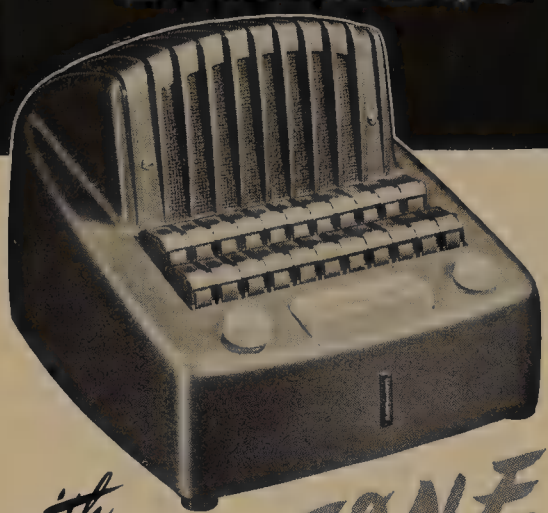

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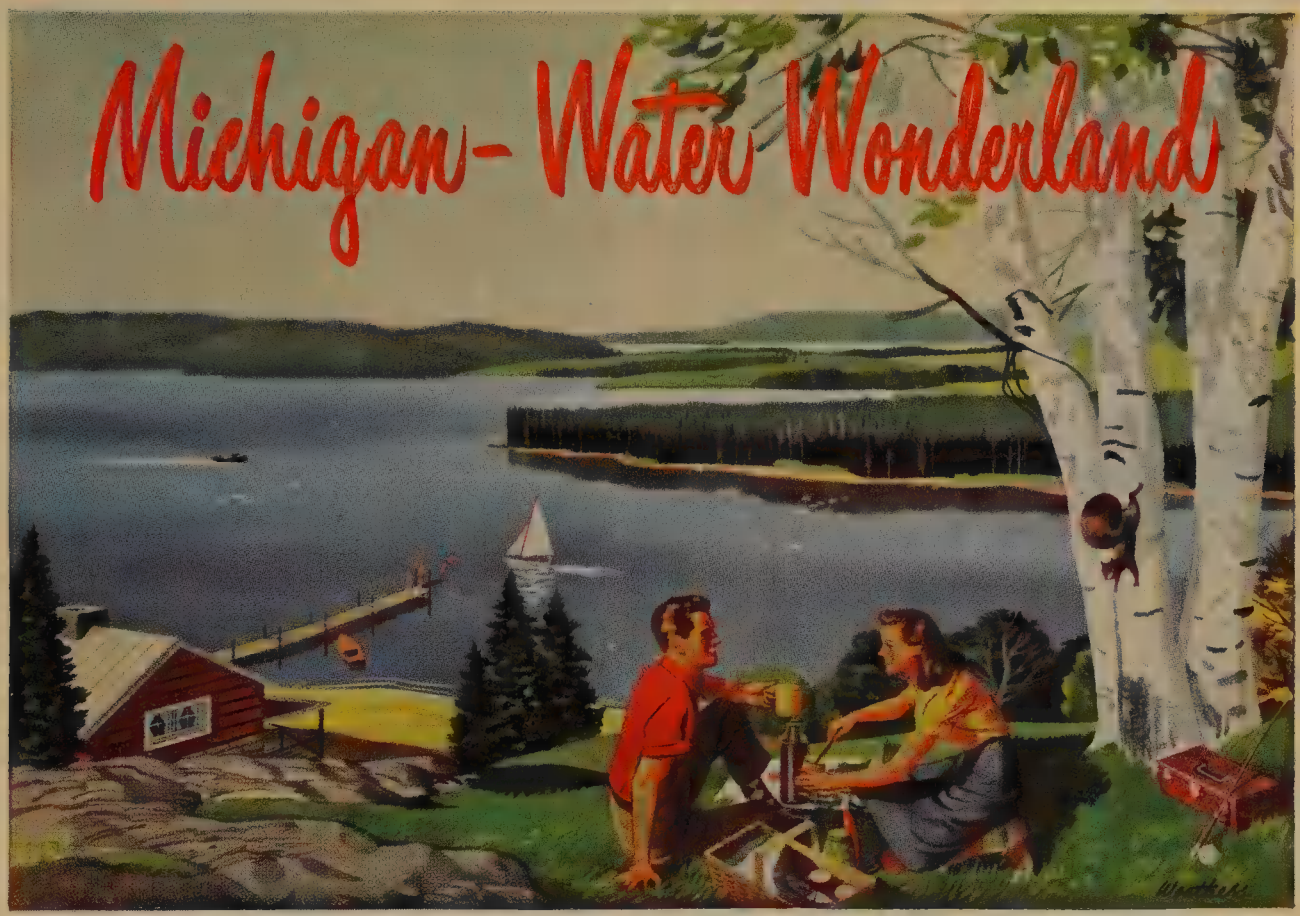

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Whatever your favorite water sport, Michigan has it—casting for never-die Northerns, angling for flashing trout, sailing across the breeze-swept blue, diving into cool, clean depths, or just lazing on a wide sweep of sun-laundered sand.

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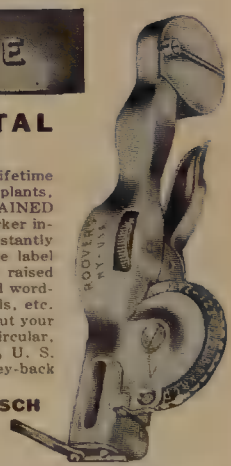

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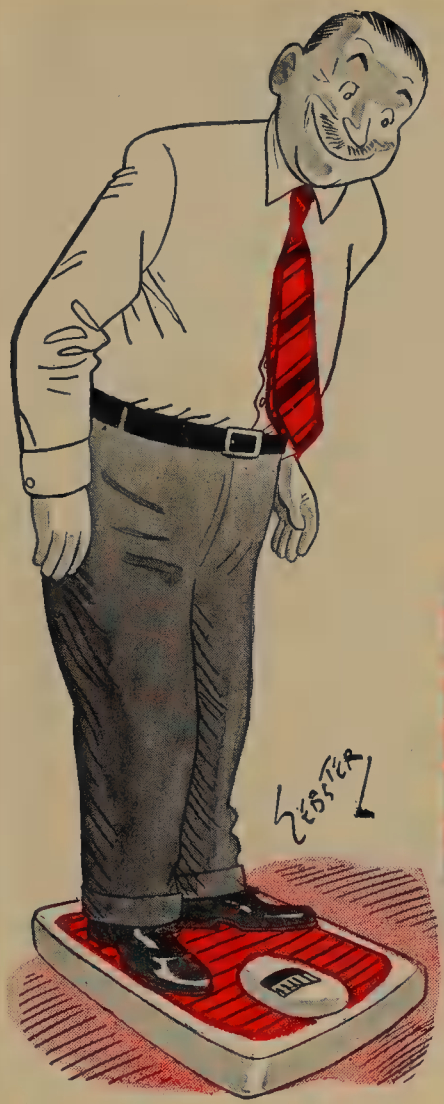


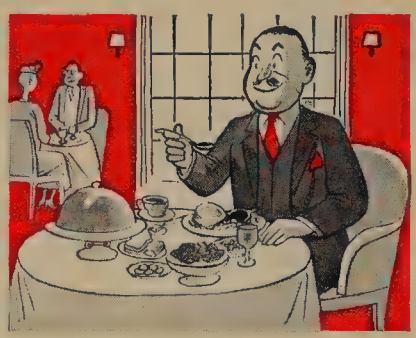
WATCH YOUR WEIGHT

1. Once you're over 30, it pays to *watch your weight.*

Under 30, a little overweight may be an advantage. But statistics show that when you are older, overweight is often associated with heart disease, kidney ailments, high blood pressure, diabetes, and other diseases.

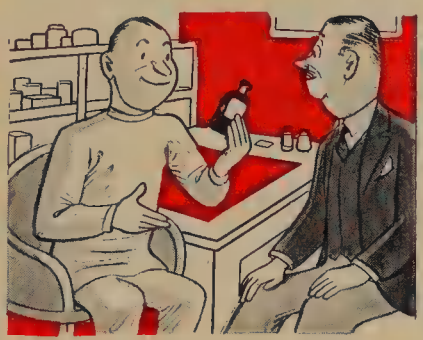
So, if you're overweight, give some thought to protecting your health by bringing your weight down.

2. See your doctor first, so he can check your physical condition, suggest approved methods for losing weight, and advise you how much to lose.



3. Your doctor will be able to help you work out a tasty, varied diet that will let you lose weight without endangering health or strength.

4. He may also ask you about the type of work you do, so that he can advise you on the kind and amount of exercise you may take.



5. It's wise not to use reducing drugs, or to try special diets unless your own doctor recommends them. They may do *you* more harm than good.

6. Once your weight is down to normal, try to keep it there. Remember that one step toward a longer, healthier life is *watching your weight.*

To bring you other helpful information about your weight, Metropolitan has prepared a booklet, "Overweight and Underweight." It includes lists of the caloric values of almost 300 foods, suggested low-calorie menus, and reducing exercises. Write for your free copy of this booklet 58-N, today.

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TO VETERANS—IF YOU HAVE NATIONAL SERVICE LIFE INSURANCE—KEEP IT!

When is it swingtime for a bittern?

THE AMERICAN BITTERN (Botaurus lentiginosus), despite his sharp beak, would rather hide from his foes than face them.

To keep from being seen by a sharp-eyed hawk or other enemy while he's feeding among the reeds, he passes himself off as a cattail. He stands with his body stiffly upright, his head pointed to the sky.

Even when the wind rustles the cattails and sets them nodding, Botaurus clings to his tricky disguise. As the reeds start swaying, the bittern begins to swing from side to side with the same motion—first with neck and head and then with his whole body.

The bittern's reed dance is a good example of the clever ways that nature equips many wild things to dodge trouble. But at best these natural protective devices are only preventive.

In providing protection for himself and his family, man has gone a lot further. He has figured out a way to keep trouble from costing him a lot of money and needless worry when it does hit home.

This device is insurance; and what a weight of worry insurance can lift from your mind!

A skid on a scatter rug may lay you up. But accident insurance will handle your medical bills and keep you going until you're well again.

Through life insurance, you can make sure right now that your family will be taken care of no matter what happens to you.

If you haven't brought your accident and life insurance up to date recently, we suggest that you see your Travelers agent *right away*.

And while you're about it, why not let him check your other insurance, too?

MORAL: INSURE IN

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VOL. XCIII, No. 5 WASHINGTON MAY, 1948

THE NATIONAL GEOGRAPHIC MAGAZINE

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Belgium Comes Back

By Harvey Klemmer

With Illustrations from Photographs by Maynard Owen Williams

EUROPE is coming back—painfully but perceptibly. And in the vanguard is a little country which was invaded not once but twice, which was occupied for more than four years, and which served as a battleground for some of the fiercest fighting of the war.

That little country is Belgium (map, page 578).

Of all those countries which were forced to defend themselves against aggression, none has shown greater recuperative powers than the Kingdom of the Belgians.

The cities of Belgium, unlike those in many countries, are ablaze with light. Neon lights are particularly noticeable. There seems to be more neon lighting in Brussels (Bruxelles) than in all the other capitals of Europe put together.

Belgian stores are filled with goods. This may not seem unusual in the United States, where shortages are the exception rather than the rule; in Europe, where even the necessities of life are generally difficult to obtain, a Belgian shop window looks like something out of the *Arabian Nights*.

Even Meat Supply Is Ample

Food, while still somewhat scarce, is outstanding in postwar Europe. Meat is not thrown around, but there is enough. The Belgian cuisine—elegant like the French but with a slightly more earthy quality—has always enjoyed an excellent reputation. Today Belgian chefs are outdoing themselves to regain the position they held before the war.

The Belgians as a people like to eat. With the exception of breakfast, which is on the light, Continental side, they make a social event and a gastronomic delight of each meal. They eat leisurely; they eat a lot; they eat with obvious pleasure. They like music with their meals, and there is much laughter and conversation.

1,300 Calories a Day

The Belgians lived on less than 1,300 calories a day during the German occupation. No one begrudges them a good meal now!

Hotel accommodations are approaching normal. Throughout the country banners proclaim the exciting news: "L'Hôtel est réouvert."

Rationing is still in force in Belgium; however, restrictions are less onerous than in most European countries—Britain, for example—and they are gradually being lifted. Meat was derationed on February 1, 1948, leaving only coal, sugar, fats, and cereals still subject to control.

Belgian industry, always dynamic, is operating at more than 100 percent of the prewar level. In some lines production is much greater than it was before the war.

The chemical industry is operating at 375 percent of the prewar rate, the woolen industry at 155 percent, the machinery industry at 118 percent. Recovery in other lines, while less spectacular, has been, on the whole, encouraging.

The glass industry, one of the largest in Europe, has been handicapped by a lack of materials. Nevertheless, Belgian glass, including crystal from the unique Val St. Lambert works, is again available (page 603).

The textile industry, one of the oldest in

Antwerp's Jules Verne Will Arrange a Night Flight to New York and Think Nothing of It

Phileas Fogg's *Around the World in 80 Days* seemed fantastic in 1872, when Verne wrote the travel tale. Now the globe may be circled by air in a tenth of the time. One can dine late in Brussels, catch a plane, and breakfast in New York. Magazines in many languages are sold at the cinema lobby on the left.

Europe and very important to the Belgian economy, is a particularly bright spot. The woolen mills of Verviers are humming; carpets are pouring from St. Niklaas and cotton goods from Ghent (Gent); the production of linen (Plate II) is pressed at Courtrai (Kortrijk), at Deinze, and at Brussels.

The Diamond Industry

The diamond industry has recovered less rapidly. The principal function of these stones is not, as one might assume, the ornamentation of the human body; of far greater importance is their use, throughout the world, for industrial purposes.

The diamond industry in Belgium is centered in Antwerp (Antwerpen), where shipping, foreign trade, and precious stones vie for leadership.

The aristocrats of the diamond-cutting profession congregate in certain cafes where they are glad to explain, over a drink or two, the intricacies of one of the most precise crafts known to man (page 581).

Each stone passes through 10 or 15 hands before it is ready for sale, and each craftsman must be a master at his particular job. Stones are graded according to color, purity, and number of facets. Those which get into the newspapers are generally large; some of the most exacting work, however, is done on small gems.

A cutter showed me stones so small I could hardly see them with the naked eye. They

A Genial Hostess Serves Coffee at Noville, Where the Battle Line Bulged

Here, where American tanks battled in a fog, nearly everything was wrecked (page 601). Today tar-paper shacks spring up among the ruins. Café du Commerce does better with a cement-block façade.

could be rolled between the thumb and forefinger like grains of sand; yet each one of these tiny particles had been carefully faceted. You wonder, watching these men at work, how they keep their eyesight.

I always wonder why diamond cutters don't look more like diamond cutters than they do. One expects to meet elderly esthetes or old men with microscopes. Yet most of the men look like workers in any other line and are preponderantly of stocky build.

David Boris is said to be a champion cleaver. He is also a billiard champion and was once a champion wrestler. I haven't seen him cleave a diamond or toss an opponent over his shoulder on the wrestling mat; but I can testify that, at the billiard table, he is grace, poise, and dynamite rolled into one.

Belgian agriculture, which was not greatly disturbed by the war, continues to maintain a high level of production, despite the severe drought of 1947 (Plate XIX).

The Belgians long have been noted for their ability to extract a large amount of food from a small amount of soil.

They are equally proficient with flowers, which, along with fruit and vegetables, are an important item in Belgium's trade with her neighbors.

Acres of Greenhouses

The natural productivity of Belgian agriculture has been augmented by an intensive use of greenhouses. Traveling through the country, I saw acre after acre of glass, including the famous hothouses of Hoeylaert, near

Drawn by H. E. Eastwood and Irvin E. Alleman

Belgium Looks Like a Table of Battles. No Wonder It Is the "Cockpit of Europe"

Armies for centuries have found the Belgian lowlands a convenient path of invasion. Here Napoleon met his Waterloo. Liége and Ypres (Ieper), Bastogne and St. Vith stir memories of two world wars. Twice in recent years the German Army burst through the forested Ardennes. Industrialized Belgium crams its 8.4 millions—710 to the square mile—into a Maryland-sized area.

Brussels, where large quantities of grapes are produced for export (Plate V).

Foreign trade is a necessity to Belgium. Although the country is self-sufficient in garden truck, thanks to the system of intense cultivation employed, the production of grains is not sufficient to feed more than one-third of the people. Two-thirds of Belgium's cereal requirements, therefore, normally must be met abroad.

"We have no alternative," said a Belgian economist. "With us it is a question of importing or starving. And, in order to pay for our imports, we must export."

Outside of coal, Belgium has few resources. This has forced the little land to become a processor of raw materials brought in from the colonies and from other countries. Belgian specialties have hitherto enjoyed a favorable market in the United States and no doubt will again, once normal conditions have been restored.

Market for U. S. Goods

On the other side of the transaction, Belgium provides a sizable market (averaging nearly $50,000,000 a month the last half of 1947) for American commodities (Plate V). The country is also a distributing point for other markets in Europe.

The Belgian Government, for the first two years of reconstruction, emphasized imports over exports in order to bring prices down and stimulate production. It was a smart move.

Bastogne Honors the American Who Said "Nuts!" to the Nazis' Surrender Demand

Here Brig. (now Maj.) Gen. Anthony C. McAuliffe, his men surrounded by Von Rundstedt's break-through, delivered his immortal defiance. In gratitude, Bastogne has set up its Place MacAuliffe, Café MacAuliffe, and this cartoon tribute. In doing so, the Belgians have inserted a redundant "a" into "Mc," but the general is not worried. One of Bastogne's famous hams is pictured on the signpost.

Prices did come down, production did go up, and exports have nearly reached their prewar proportion of 90 percent of imports.

Although Belgium is a participant in the European Recovery Program, she is less interested in direct aid than in the rehabilitation of countries which normally buy her goods. Meanwhile, Belgium has herself been extending aid. Credits aggregating more than $300,000,000 have been granted to various countries.

Belgium has also been re-exporting for "soft" currency some of the goods which she has purchased for dollars in the United States.

A step in the direction of freer European trade, and one which may have far-reaching consequences, is the customs union recently created by Belgium, the Netherlands, and Luxembourg. This union, popularly known as Benelux, has aroused great interest throughout Europe; it is particularly significant in view of the possible formation of a Western bloc as a counterpoise for the organization which has been effected in eastern Europe.

Trains and Buses Run Again

Belgian transport is well on the way to recovery. Trains and buses are running normally. Gas rationing has been abolished. There is an acute demand for automobiles, as elsewhere, but new vehicles are coming in from France, Great Britain, and the United States.

The inland waterways, an important link in the country's transportation system, are functioning as usual (Plate XXI).*

Belgium is still short of ocean-going shipping. However, vessels now under construction, in addition to those acquired from other countries, are expected to restore the merchant marine to its prewar status.

* See "Through the Back Doors of Belgium," by Melville Chater, NATIONAL GEOGRAPHIC MAGAZINE, May, 1925.

Cargo moving through Antwerp has been greatly reduced, principally as a result of decreased activity in the German hinterland, normally served by this port. The future of Antwerp will be determined largely by what the Allies do in Germany.

United States vessels, which before the war ranked ninth, today lead vessels of all nations in volume of cargo handled at Antwerp.

Belgium is ideally situated to be a junction between the Old World and the New. She is located in one of the most highly developed areas on earth; she has excellent communications.

There is practically no unemployment in Belgium; in fact, most industries are making frantic efforts to recruit workers.

There is a serious shortage of coal miners. To relieve the situation in this direction, the Government has recruited men in foreign countries.

The textile industry is handicapped by a lack of young women workers for the mills. Farm girls, who formerly constituted a large part of the labor force, have learned other trades. Moreover, prosperous conditions at home have caused many to stay on the land.

Servants are hard to get, and the matrons of Brussels sound very much like the matrons of Washington or St. Louis in their laments.

Relations between labor and management, while delicate, have been relatively stable. Strikes, despite an unsatisfactory relation between wages and the cost of living, have been few.

A strike which did occur, and which detracted considerably from the pleasure of my sojourn in Brussels, tied up the Opera House for an entire month when artists and other personnel refused to work without a raise in salary.

Reasons for Rapid Recovery

There are several reasons for the relatively rapid recovery achieved by the people of Belgium.

The Belgians, first off, had a distinct psychological advantage in dealing with the enemy. These people have suffered occupation so often that they have developed a positive genius for outwitting authority.

The Belgians gained an additional advantage from the fact that they were liberated sooner than some of their neighbors.

The destruction of property in Belgium, while burdensome, did not approach that suffered by some countries. Belgian industry was more or less ready to go when the war ended. Moreover, the Port of Antwerp, one of the most efficient in Europe, remained open.

Belgium also had a wealthy empire, which remained inviolate throughout the war, at her disposition. Her gold reserve, meanwhile, was waiting for her in the United States.

The Belgian Government, while the Germans were still in the country, made plans for the rehabilitation of industry, for the protection of labor, and for the stabilization of the currency.

The rehabilitation of industry is, as has been pointed out, now in an advanced stage.

A comprehensive plan of social security was put into effect immediately after the cessation of hostilities. This showed the working population that the Government had their interests at heart. It also gave Belgian labor an advanced system of unemployment insurance, old-age pensions, health benefits, family allowances, workmen's compensation, and other advantages.

Industry's Wise Leadership

The situation was further improved by the fact that Belgian industry boasts some of the most intelligent leadership to be found in any country.

The Government, finally, promulgated a series of bold measures designed to block off excessive purchasing power and to stabilize the currency.

The financial situation was desperate after the occupation. The circulation of currency was five times greater than in 1939; the budget was out of balance; a large German credit had to be added to the public debt. To correct these conditions, the Government was forced to adopt one of the most radical financial programs ever employed in a democratic state.

Details of the Government's program were worked out while the war was still on.

New bank notes to replace those then in circulation were printed in Britain. Depositors' receipts and other forms were printed by the National Bank in Brussels right under the noses of German inspectors. When the enemy finally was driven out, everything was ready for measures required to preserve the franc.

It was a novel, a fearless, and a far-reaching approach. The franc was revalued. All bank notes valued at more than 50 francs were called in. Bank accounts were frozen. General taxes were increased and three extraordinary levies—a 5-percent levy on capital, a 70- and 95-percent levy on excess profits and income, and a 100-percent levy on profits made in dealing with the Germans—were imposed. A control system for foreign exchange was inaugurated.

Some of the Belgian measures were pretty

Staff Photographer B. Anthony Stewart

An Antwerp Grader Examines Coal's Hard, Brilliant Cousin, the Diamond

Diamond is related to the graphite in a pencil as well as to that "black diamond" called coal. All three are forms of carbon. Since diamond is a hard cutting substance, industry uses the stone or its dust as an abrasive. The jewel does not owe its brilliancy to polish alone but also to light-reflecting facets (page 576).

strong medicine, but they seem to have worked.

Belgium's fiscal position was further improved by the expenditures of British and American troops; by loans totaling $150,000,000 granted by the Export-Import Bank to cover purchases made in the United States; by a credit of $25,000,000 extended by Canada, and, finally, by a credit of $11,000,000 granted by the International Monetary Fund.

In addition to the foregoing grants, Belgium may draw another $56,500,000 from the Fund during 1948.

Industry of People Key to Recovery

The principal factor in the recovery saga, of course, has been the industry of the people.

Belgium, with about 8,400,000 people crowded into an area little larger than that of Maryland, is one of the most densely populated countries in Europe. The number of inhabitants to the square mile is about 710, compared with 48 in the United States. Despite this lack of "living space," Belgian industry and Belgian agriculture have reached a high development.

Everybody works in Belgium—men, women, children, animals. The tempo of city life is brisk.

In the country you will see people going into the fields at dawn, and if, perchance, you return at dusk you will find many of them still there.

Driving in the country at night is made difficult and hazardous by a procession of carts creaking their way home, heavy-laden, from the fields.

Another thing which strikes the visitor is the number of people with bundles on their backs. Everyone seems to be carrying something; those who aren't will probably be pushing bicycles, carts, or wheelbarrows.

A Belgian will carry anything on a bicycle—boxes, bundles, bales. Once, along the Schelde, I saw a man pedaling over the cobblestones with a barrel between his arms.

In addition to bicycles, three- and even four-wheeled carts are operated by foot power.

Animal power is also used widely in Belgium. Belgian horses are noted for their size and stamina. In addition, dogs are used for pulling carts, and you may even see a dog helping to push his master's cycle (Plate XXII). Cows are also used as beasts of burden.

Walking near Namur one afternoon, I was startled to see a procession of hay wagons, four in all, moving majestically down the road behind a power plant consisting of two horses and a cow.

Hard work does not seem to prevent the Belgians from living a full life. They like a good time and, somehow or other, they manage to enjoy themselves.

It would be a mistake to conclude from these observations that Belgium's worries are over. They aren't, and the little country may have to make additional sacrifices before her economy is placed on an even keel and living conditions are in all respects restored to their prewar level.

Belgian industry is greatly in need of modernization. Machines and factories are in many instances worn out; others are outmoded. Belgium must overhaul her equipment to catch up with the technical progress achieved by other nations during the war.

"We also have a psychological hazard to get over," one manufacturer said to me. "During the occupation our strategy was to produce as little as possible. For four years we operated at less than half of capacity. Now we find it difficult to get back into the swing of capacity production."

An economist at the American Embassy in Brussels, who is generally optimistic about Belgium, points out that the little country is now "bumping a ceiling."

Coal a Vital Need

"The Belgian economy is based on coal," he explains. "Coal production has risen to 80 percent of the prewar figure. However—and this is an important qualification—production seems to be stalled at this figure. Obviously, the Belgians will need more, not less, coal if they are to get back on their feet economically."

The Government has endeavored to keep prices and wages in line, but there have been some breaks and there may be more before the economy is stabilized. Prices on many items, especially luxury goods, are high by American standards.

Rent increases are controlled, but when people move they sometimes find themselves paying three or four times what they paid before the war. The Belgian worker, notwithstanding a doubling in his income, is not happy about the cost of living.

The black market, which was encouraged during the war as a device for outwitting the enemy, has virtually disappeared.

Belgium's Housing Problem

Belgium, in common with the rest of Europe, has a housing problem. The situation is acute in Antwerp, where over 50 percent of the houses were damaged or destroyed by enemy action, and in Liége. Belgium was once acclaimed as "the best-housed country in the world." The destruction of property in two wars affected this coveted position.

Not only houses are short in present-day Belgium. Schools, churches, stores, theaters, factories, warehouses—all are required in substantial numbers.

More than 3,000 school buildings were severely damaged during World War II and 281 were completely destroyed. Even more serious, educators say, is the disruption of education caused by the occupation.

The schoolteachers of Belgium have a real problem on their hands. Their charges for years were handicapped by irregular attendance, by shortages of food, fuel, and clothing, by rushes to air-raid shelters, by lack of rest. Many children were forced to lie and cheat in order to outwit the enemy; some were hunted by the Gestapo; others lost their parents.

Then there was the Nazification of schools. Anyone less indomitable than a schoolteacher, and less industrious than a Belgian, would be appalled by the educational job which must be done in this country.

The political situation is in a state of uncertainty. The current government is based upon a coalition of the Christian Social and Socialist Parties.

The country is divided, rather seriously, over the question of whether or not King Leopold should return to the throne.

Belgium is further divided by a long-standing rivalry between the two groups which make up the population—the Flemings and the Walloons.

The Walloons were once dominant in the affairs of Belgium. Now the Flemings have achieved equality, and there is considerable controversy with regard to the status of the two groups.

The Flemings, who live in the northern half of the country, speak a Dutch patois. The Walloons, who live in the south, have, since the 13th century, spoken French.

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Kodachrome by Maynard Owen Williams

Best-known Lacemaker of Historic Bruges (Brugge) Is This Venerable Cover Girl

Her picture, widely published, was on the poster for the splendid Lace Exhibition of 1947. Her face—a well-lined history book of humble toil—is a trade-mark for Bruges lace, as Chardin's "La Chocolatière" is for Baker's cocoa.

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Kodachrome by Maynard Owen Williams

Belgium's "Golden River," the Lys (Leie), Is No Longer Clogged by Sunken Rafts of Rotting—or Retting—Linen

Nowadays the linen fibers are freed of the useless inner tissues by soaking them in tanks flooded with heated water. Over the sunny field of drying flax hangs a sour.

When Bruges Ranked with Venice as a World Market, Its Port Was Here at Damme

Painters, intrigued by quiet canal and tufted trees, have displaced the stevedores who sweated cargoes ashore. In the thirteenth to fifteenth centuries, Damme was "the most famous of ports."

At one time the 1,700 sailing ships of Philip Augustus were anchored in what are now meadows. Valleys have silted up. Dune sand has filled in the hollows. Islands have become a part of the mainland where Belgium joins the Netherlands.

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Kodachrome by Maynard Owen Williams

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IV

Kodachrome by Maynard Owen Williams

Father and Mother Point Out Brussels' (Bruxelles) "Most Famous Citizen," the Many-costumed Manikin

Sometimes the grotesque but daring figure wears the feathers of an Indian chief or the uniform of the beloved GI. Here he wears a uniform from the Ardennes, close

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Kodachromes by Maynard Owen Williams

So Costly Are Belgian Hothouse Grapes that Oranges from Distant America Outsell Them in the Market Place at Furnes (Veurne)

Each bunch is pampered through the winter, competing with cold citizens for strictly rationed coal. Such huge grapes as the Leopold III (right) are sold beside California, Florida, or Brazilian oranges, but at eight times the price per pound.

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VI

Kodachrome by Maynard Owen Williams

White-prowed Swans Split a Water Mirror at Bruges, Once the Busiest Mart in North Europe

commercial activity reigned and trading guilds had their headquarters, the quiet canal now leads a graceful, unruffled life.

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Kodachromes by Maynard Owen Williams

Sight-seers in Spotless Launches Cruise under the Bridges Which Gave Bruges Its Name

Along peaceful canals, visitors ride to Memling's famous paintings in St. John's Hospital or to the shady Lake of Love, dotted with snowy swans. Red geraniums and bright flower boxes add to the appeal of the picture town of Flanders, famous for its dramatic Pageant of the Holy Blood, brought from Jerusalem in 1149.

"Treasures of Christ's Church" Parade in Honor of St. Laurent, Patron of This Quarter

This martyr considered children more worthy than gold and gave the church treasures to the poor. He was roasted on a gridiron bed by the infuriated prefect.

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Young Lads Bear Aloft Bright Banners Honoring Brussels' Patron Saints

In a square below the Tomb of Belgium's Unknown Soldier they kneel while the city is blessed. From here the procession moves to the Cathedral of St. Michael and St. Gudula.

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Scores of Such Belgian Carnival Groups March in Folklore Parades

Competing for banners or prizes, these merrymakers go from festival to festival, having a good time, dancing in the squares, and putting on a colorful show. Here at Courtrai they wear costumes from neighboring Netherlands.

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X

Kodachrome by Maynard Owen Williams

Belgians All, the White-capped Merrymakers Call Their Carnival Group at Courtrai "the Volendammers"

Hours of marching and street dancing lie ahead. Now they sit, awaiting the start of one of many folklore parades which add color to the summer scene.

In Heavily Padded Suits, Ostend's (Oostende) Fishers Parade Sea Symbols to the Tinkle of Bells

"Shoot us!" laughed the woman on whose friend a stuffed sea gull was perched.

Small as she is, the mermaid (right) makes a heavy millinery ornament.

Such dancing, prancing carnival figures are called *Gilles*. Local Courtrai groups wear linen bobbins or scutching wheels on their heads.

But most famous of all are the high-plumed street dancers of Binche, their jingling sound as gay as sleigh bells in the snow (Plate XXIII).

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Kodachromes by Maynard Owen Williams

Cradled Ashore at Ostend, a Car from Dover Will Soon Speed along the Splendid Highways of Belgium

Tourists from Britain bulked large in European travel. Some reserved the same rooms year after year. But since October 1, 1947, travel on the Continent has practically ceased, for Britons may not carry funds abroad for vacationing. Splendid ferries maintain a short and comfortable service between Ostend and Dover.

Until Zeebrugge developed its curving mole and was connected with Bruges by a 9-mile canal, Ostend was the only important seacoast harbor in Belgium.

The old fishing village, which once saw Crusaders sail, became a favorite pleasure resort and summer residence for the Royal Family. Two wars rained death and destruction on the city, which is now bravely digging itself out of the ruins.

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Summer Sports in Sands Now Freed of Deadly Mines Show the Futility of Hitler's Atlantic Wall

Heavy cement blockhouses near Ostend stand idle while children play along the 40-mile seacoast facing England. One Victory Bunker, its walls still covered with German murals by homesick Nazi soldiers, is now a tearoom and night club. Here German boys had a beer or a shave to escape the boredom of waiting. Present-day visitors gather in the thick-walled hide-out from death to watch the antics of a clown or dance to American music.

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XIV

Kodachrome by Maynard Owen Williams

Rainless Days, Cruel to Europe's Farms, Made 1947 a Banner Year on Belgian Beaches, Which Stretch from France to the Netherlands

Visitors crowded shell-torn hotels. Restaurants offered better meals than are common in postwar Europe. Gay umbrellas brightened the sands. Belgian vacationers rested up for another year's hard work.

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Kodachromes by Maynard Owen Williams

Near Ostend, Sister Poses to Her Finger Tips. At Aristocratic Le Zoute, Two Pedicyclists "Get Set" to "Go!"

Sunshine, which ruined many crops, spread plenty of sun tan along the Belgian coast. Hundreds of hotels offered accommodations at from $3 to $12 a day. Quick repairs were made to blasted buildings. Once more the golden beaches belonged to a peaceful land.

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Kodachrome by Maynard Owen Williams

Five Towers of Tournai's Matchless Cathedral Still Stand above the Ruined City

From Romanesque to Renaissance, this architectural masterpiece took over 500 years to build. Unlike the City Hall, Public Library, several churches, and more than 1,200 houses, the finest of Belgian churches was not razed by war.

Many Belgians are bilingual: they speak both Flemish and French. Some, in addition, speak a patois of the two. A Brussels shopkeeper told me that he found it easier to understand his British and American customers than his Antwerp customers, while the people of Antwerp complain that they have difficulty understanding their compatriots from Brussels.

Near the German border, meanwhile, there are villages—Eupen, Malmédy, and St. Vith, among others—where the people speak a German dialect.

The tourist business is important to Belgium, and, with its long succession of rainless days, 1947 was a most successful season, especially along the coast.

Visitors coming here will, as hitherto, find much to see and do. Belgium has always been a mecca for sight-seers, particularly for those who like to delve into the past. Now, to the remnants of a rich, old civilization has been added the heritage of yet another chapter in the grim, turbulent, and immensely exciting history of the "Cockpit of Europe."

Scars of War Still Abound

Signs of the country's most recent ordeal are still plentiful.

Going up the Schelde, I noticed the hulks of sunken ships along the shore.

The General Motors factory at Antwerp was a flattened mass of concrete.

Damaged houses, some without roofs, some propped up with poles, were a common sight.

Trenches, pillboxes, and faded camouflage were still in evidence.

Old American and British signs mark routes taken by the liberators, including the famous ABC Highway which ran from Antwerp to the front.

Bits of battle debris may still be seen in the fields, and here and there a giant crater marks the spot where a bomb came screaming to earth.

Stretches of the Atlantic Wall, pathetic reminder of enemy nervousness, remain along the coast (Plate XIII).

And occasionally you will come upon former prisoners of war, including superman coal miners, helping to rebuild the country which they tried to destroy.

The Belgians are trying to forget the war; nevertheless, the war is still very real, and practically everyone you meet has a story which he will pass on, without too much prodding, for the benefit of posterity.

There is the Flemish ship pilot:

"There were 20 ships in the first Allied convoy to come up the Schelde. I had an American Liberty. I was so excited I could hardly do my job. It had been five years since I had handled a large ship. That Liberty looked like the *Queen Elizabeth*."

There is the Antwerp businessman whose home was used as a headquarters by the Germans:

"Many notables came here. Goering. Von Rundstedt. Rommel. Goering slept in my bed. Later the British and Canadians were here. Montgomery came, and King George.

"The Germans gave us four hours to get out. They asked for a key to the bookcase so that they could read. Although there were several anti-Nazi books in my library, none of these was disturbed. . . . Strange people, the Germans."

The businessman's wife takes up the story:

"They put runners on the carpets and left everything as they had found it. We hid the silver and paintings. The Kommandant found a metal tray and wanted to know what it was for. I told him that it was the tray from which Napoleon ate his last breakfast. The Kommandant grimaced and put the tray away."

Listen now to a Belgian soldier:

"We were impressed by the German equipment. It was good and there was plenty of it. But when the Americans came, we knew that victory was ours. Here was equipment even better than that of the Germans. And when it came to quantity—!

"I was on my way up to the front. For four days and nights the tanks and trucks rumbled by. We knew then that the end would not be long in coming."

A Country of Contrasts

Belgium is a country of contrasts. She is at once earthy and elegant—a land of peasants and well-dressed women, of wooden shoes and fine gowns, of horsecarts and automobiles. She is a land of old churches and modern homes, of intense agricultural activity and busy factories. The union of art and industry, which here has been developed to a high degree, finds expression in the slogan frequently applied to Antwerp—"World Port and City of Art."

The same slogan could be applied to Ghent, which, in addition to its historic and artistic attractions, also serves as Belgium's second port (Plate XXI), as a textilë center, and as the focal point for a vast flower-producing area.

Brussels is a gay and shining spot, filled with music and laughter and art and antiquity and industry and politics and diplomacy and education and—but why go on? (Plate VIII.)

Belfry of Bruges, Famed by Longfellow, Shines in Lace

Lace began as a patch-in-time to save wear. This specimen was one of hundreds, some dating to 1599, shown at Bruges's 1947 exhibition of Belgian lace. Longfellow wrote: "In the market place of Bruges stands the belfry old and brown; thrice consumed and thrice rebuilded, still it watches o'er the town. As the summer morn was breaking, on that lofty tower I stood, and the world threw off its darkness, like the weeds of widowhood."

If you haven't visited Brussels, go and see for yourself. You will never forget it.

My favorite city is Bruges (Brugge)—once a port, once a textile center, now a repository for one of the most interesting historical heritages on earth. If you like old buildings; if you like quaint bridges and sleepy canals (Plates VI, VII, XXIV); if you like lace, produced by quick-fingered old women while you watch (Plate I); if you like the timelessness of a bygone civilization projected into the present—then by all means don't miss Bruges.

The estuary connecting Bruges with the sea is filled with silt (Plate III); the textile industry has moved away; moss creeps through the cobblestoned streets.

Nevertheless, the city is far from dead. It is a mellow place, and a wistful place, but the achievements of the past, which proclaim themselves on every hand, shine through the city's crumbly exterior with a light which will never be extinguished so long as man looks to the past for guidance to the future.

If you haven't discovered it by now, this traveler is fond of Bruges!

The aura of antiquity which hangs over Bruges is characteristic of Belgium. There is an old restaurant in Antwerp which is popular with visiting gourmets. It is a charming place, with leaded windows and blackened rafters, picturesquely located at the end of an ancient courtyard. One day, after an excellent lunch, I asked the waiter when the restaurant was established.

"In 1777," he replied.

The manager, who was hovering near by, looked pained.

"The correct date is 1774," he said.

The waiter retired in some confusion. Whereupon a slightly inebriated gentleman at the next table observed dryly:

"It just goes to show how old the eating habit is."

The Grand' Place in Brussels is, of course, a "must" for tourists, as is Rubens's house in Antwerp. There is also much to delight the eye and lift the spirit at Liége, at Tournai (Plate XVI), at Louvain (Leuven), at Audenaarde, and at Malines (Mechelen).

The archives of Tournai, popular with visitors before the war, unfortunately have been destroyed. Other treasures which have been lost include the Abbey at Nivelles and the library of the University of Louvain, destroyed also in World War I and reconstructed with American aid (Plate XVIII).

A Land of Bells

The carillon at Malines will stir those who thrill to bells. Belgium is a land of bells.* The Nazis took many away for melting down; however, the underground succeeded in saving many of them and eventually, amid great celebrations, in returning them to their age-old repositories.

Historical and religious festivals, known as kermesses, are numerous in Belgium (Plates IX, X, XI, XXIII). They are based on the

* See "Singing Towers of Holland and Belgium," by William Gorham Rice, National Geographic Magazine, March, 1925.

folklore of bygone centuries and are held on various dates in all parts of the country. Some of these festivals go back a thousand years or more, and, because of their historical import and the costumes employed, are interesting to watch.

Sports, pretty well out of the picture during the occupation, have made a rapid comeback. The pigeon racers are out in force; archers loose their shafts from the strings of countless bows; Belgian cyclists have reverted to their long-standing habit of collecting championships wherever they can find anyone to ride against them.

The Belgian seacoast was heavily fortified by the Germans (Plate XIII).

The fortifications are now being demolished and many of the resorts which made the littoral a play place for all of Europe have been reopened (Plates XIV, XV).

A Master Craftsman Sets the Threads for a Damask Tablecloth

Above him, the paper pattern is red and white. When woven, the fabric will be white on white, its pattern resulting from the arrangement of warp and weft. Damask takes its name from Damascus, where gold and colored threads emphasized the pattern.

Zeebrugge, destroyed in World War I and again in World War II, is in process of reconstruction.

The most spectacular scenery in Belgium is found in the Ardennes, a region of great beauty located in the southeastern part of the country. Here is a glorious landscape compounded of timbered hills, green valleys, and rippling streams. The forests are especially impressive—deep, mysterious, solemn. And over all hangs an atmosphere of times gone by, expressed in feudal ruins, ancient customs, and hoary legends.

You come out of the Ardennes exhilarated and subdued—exhilarated by the breathtaking beauty which you have been privileged to behold, subdued by the mystery of the brooding forests and the eternal hills.

The Ardennes have a special appeal for Americans, for it was here that our troops stopped, held, and then threw back Field Marshal Karl Rudolf Gerd von Rundstedt's legions in the Battle of the Bulge.

The Germans, who had already been driven from Belgium, poured back across the border in a desperate effort to throw the Allied timetable off balance, to separate the American and British Armies, and possibly to capture our supply center at Antwerp.

It was a bold gamble, and for a time it looked as if the enemy might succeed. Eventually, however, we threw the invader back, thereby shortening the war and writing a new and brilliant chapter in the history of American arms.

Rebuilding in the Bulge

The people of the Bulge are making a heroic effort to restore their shattered villages.

The little stream which loops around Houffalize is choked with rubble. There is a temporary bridge over the stream and shopkeepers carry on in shacks.

Noville, where our tanks battled in a fog, is a shambles (page 577). People are living in wooden huts; church services are held in a tar-paper shack; the Café du Commerce holds forth in a tiny cement-block building.

At Remofosse there is a farmhouse which is being used as a shelter for livestock; the farmer and his family, meanwhile, have moved into the barn.

The Government is building model homes in the razed village of St. Vith. Elsewhere—at

© K. Witte

In a Hekelghem Cafe an Artist Copies Rembrandt's *Night Watch* by Sifting Colored Sand with His Fingers

This "sand carpet" depicts the famous *Sortie of the Civic Guard*. When finished, it will remain on display until dust dulls its colors. If sprayed with a fixative, it may be hung on a wall as a permanent fixture. Sand pictures drawn by medicine men are a popular art form among Australian aborigines and American Indians.

Armed Guards Patrol the Diamond Club of Antwerp

This corridor, protected by armor plate, surrounds a safety-deposit vault.

This Crystal Vase Duplicates One Made for a Japanese Prince

GI's admired art objects in Val St. Lambert glass works near Liége.

A Tapestry Artist in Malines Repairs a Centuries-old Masterpiece

Belgium has no greater asset than her artisans trained in creative work. Malines, long a center for wood carving and luxurious textiles, is noted for its carillon music, joyously rippling down from heaven. Such bell masters as Jef Denyn and Staf Nees brought fame to St. Rombold's 45-bell carillon (page 600).

Malmédy, near which the Germans executed 71 American soldiers; at Stavelot, at Marche, at Laroche, at Bastogne—local citizens are repairing their homes and stores and farm buildings as best they can.

An American Shrine

Bastogne is in process of becoming an American shrine. Here it was that the Americans under Brig. (now Maj.) Gen. Anthony C. McAuliffe, although surrounded, held Von Rundstedt at bay; here it was that McAuliffe sent his celebrated reply—"Nuts!"—to the German demand that he and his men surrender (page 579); here it was that the Germans finally realized, if they hadn't realized it before, that the war was over.

Bastogne today is a beehive of activity. Seventy percent of the town's buildings were damaged or destroyed. Those which are too far gone to save are being pulled down; bricklayers, stonemasons, and carpenters are restoring the others as rapidly as possible. It gives you a lift to see the energetic way the people are going about the business of rebuilding their devastated town.

The main street is a maze of ladders and scaffolds. Piles of lumber, brick, and stone greet you on every hand. A sawmill has been set up not far from the main square, while up in the hills gangs of men crash trees to the ground for desperately needed shelter.

Debris, thousands of tons of it, has been carted to a huge dump. German prisoners,

Wide World from Press Ass'n

Ostend Lads March in Clogs and Oilskins to Witness the Blessing of the Sea

Behind this pleasure resort, now badly damaged, lie a thousand years of history as a fishing port. Fish and cheese perfume its old markets. Once a year priests and fishermen take part in the traditional ceremony on the water front. These boys bear a ship model which their grandfathers carried before them.

dirty and dejected, were being used for this work when I was there.

The town's main hotel, the Le Brun, was hit seven times by shellfire, which rendered 27 out of 36 rooms uninhabitable. The basement was used as a hospital, and Anne Le Brun, pretty daughter of the proprietress, tore up the hotel linen for bandages.

The dining room was spared—a circumstance which permitted me to enjoy a wild-boar lunch in some of the nicest company a stranger in the Ardennes could ever hope to know.

The people of Bastogne naturally feel a great warmth for Americans. They have named the main square for McAuliffe and the General's picture is freely displayed; the town fathers voted to erect a monument to those who gave their lives in the Battle of the Bulge; some persons have "adopted" the graves of American soldiers and correspond regularly with relatives in the United States.

Most of the Americans who fell in the Battle of the Bulge were buried at Hamm, in Luxembourg, and at Foy, near Bastogne. Other Americans were buried at Fosse (near Namur) and at Neuville en Condroz and Henri Chapelle (near Liége). Nearly 28,000 men, altogether, were laid to rest on Belgian soil.

The funeral ships are now bringing our dead home. Many of those who fell in Belgium will remain as a permanent link between two coun-

tries which, although distant and dissimilar, have found it necessary to make common cause in the never-ending fight for freedom.

Bastogne's "Nuts Day"

December 17 is known in Bastogne as "Nuts Day." On this day a young man interested in matrimony offers his girl a bag of nuts; if she accepts the nuts, they are betrothed and, according to custom, will marry within the next year. It is an old ritual but one which almost inevitably will become associated with the rejoinder of our troops to the German ultimatum.

Bastogne's historic siege aroused the admiration of the world, and many people are expected to visit the area when conditions permit. Americans who participated in the Battle of the Bulge will certainly want to go back; in fact, some have already returned to look up old friends and to tramp over ground wrested at such cost from the enemy.

Until recently souvenir hunters had no trouble picking up mementos of their visit. The woods and fields were sprinkled with reminders of the fierce encounters which raged all through this area. An American Graves Registration Service official whom I met at Foy laughed when I asked if there were any souvenirs lying around.

"There's a pile of German helmets behind the house," he said. "And if you want to go down in the woods you'll find plenty of cartridge cases, gas cans, and so on."

He was silent for a moment and then added: "Oh, yes, there are also some German boots, but I think I should warn you that they still have feet in them!"

Years of Restoration Work Ahead

The Belgians, no mean souvenir hunters themselves, have collected an enormous amount of material from the battleground. Tanks and other vehicles were stripped of everything that could be carried off; helmets have been picked up by the hundreds; guns and knives are hoarded, and in house after house Madame brightens up the surroundings by a lavish use of well-polished shell cases.

And now, what about the future?

Belgium has taken a beating—make no mistake about that—and it will take years of hard work to repair the ravages of the last few years.

Belgium was occupied for 52 months. During this period loot removed from the country by the Germans amounted to between 6 and 8 billion dollars.

The wartime destruction of property, although less than that suffered by many countries, was nevertheless extremely heavy in relation to the size and population of Belgium.

It would not be surprising, in view of what they have been through, to find the Belgians imbued with an implacable hatred toward Germany. But that apparently is not the case. The reaction of the average Belgian is not so much hate as disgust, plus a profound disappointment in a neighbor who seems to be congenitally unable to keep the peace.

The contempt of the Belgians for Germany finds expression in many ways.

The proprietor of a restaurant in Antwerp has trained his dog not to touch food if anyone says "Hitler." Only when you say "Leopold" or "Churchill" will the dog eat.

Statues of the Manneken, that distinguished little man who adorns a fountain off the Grand' Place in Brussels, have been combined with the swastika to express with typical Belgian earthiness the attitude of the populace toward Nazism (Plate IV).

A Brussels girl with whom I talked said that her father, a baker, had been sent to Belsen. He was never heard from again.

"I hope he died quickly," said the girl.

Her brother, a slave worker in Germany, escaped and joined the British Army. His one idea was revenge, and when he was sent to Germany as part of the British Army of Occupation he could hardly wait to start pushing Nazis around. Alas for his oft-rehearsed schemes! He married a German girl.

That's the way it is with countries. Belgium has plenty of reason to hate the Germans, but she knows, deep in her soul, that she must learn to live with them. Brussels is less than 75 miles from the German border. Germany has products which Belgium needs, and Belgium has products which Germany needs. Finally, and perhaps most important of all, the great Port of Antwerp must depend for much of its livelihood on commerce which originates in Germany.

If the Germans can demonstrate their ability to live at peace, they need not worry about the Belgians.

Belgium is also anxious to co-operate with other nations in the maintenance of peace. She is jealous of her independence, but she knows that only through international collaboration can war be prevented. Belgium, accordingly, is a loyal member of the United Nations.

Belgium is on the route of invasion. For centuries she has been trampled by the armies of warring powers. She will do everything she can to see that war does not come again—to any country, anywhere.*

* For additional articles on Belgium, consult "National Geographic Magazine Cumulative Index, 1899–1947."

Stylized Sky, Sea, and Smile Ornament Brussels' Chinese Pavilion

Near Royal Park, this Oriental structure houses a splendid collection of Far Eastern art.

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Kodachromes by Maynard Owen Williams

Crucifix and Flowers First; the Hair-do Can Wait

On St. Laurent's Day, workers' homes are decorated (Plate VIII). Sand and confetti camouflage the cobbles. The pageantry of bright banners and gay-robed children dominates this modest quarter.

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Kodachrome by Maynard Owen Williams

Above Herbert Hoover Place, Louvain's University Library Raises Its Bandaged Head

A Canadian War Vehicle Helps Reap a Peacetime Harvest Where Napoleon Met His Waterloo

In the distance rises the 28-ton Belgian lion, cast by John Cockerill of Liége from captured French cannon.

© National Geographic Society

Kodachromes by Maynard Owen Williams

Hands Help Legs Lift Visitors Up Waterloo's Artificial Memorial Mound

From His High Pedestal in the Friday Market, the "Brewer of Ghent" Exhorts His Followers to Ally Themselves with England

In this rallying place the Counts of Flanders promised to respect the rights of the liberty-loving citizens.

Jacques van Artevelde, to make sure of having English wool, backed England, while the aristocracy of Ghent (Gent) supported France.

When he tried to have an English prince made a Count of Flanders, the tide turned, and a political enemy killed him in his own house.

In bilingual Belgium, Jacques' name appears as "Jacob" on the monument.

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Kodachrome by Maynard Owen Williams

Gothic Guild Houses Look Down on an Outgrown Waterway Through Ghent

When Antwerp (Antwerpen) was attacked by flying bombs, the Port of Ghent did heroic service for the Allied cause.

Throughout April, 1945, Ghent discharged daily 962 tons of precious war supplies for each ship—"the highest output per ship ever attained in the European Theater of Operations, including the ports of Britain, the Mediterranean, of France, and of Belgium."

Now the new port is being improved, but barges still float through the heart of the town.

At the right is the Quai aux Herbes, lined by fine old houses, among them the House of the Skippers and that of the Grain Measurers, of this mid-city port where the Lys joins the Schelde.

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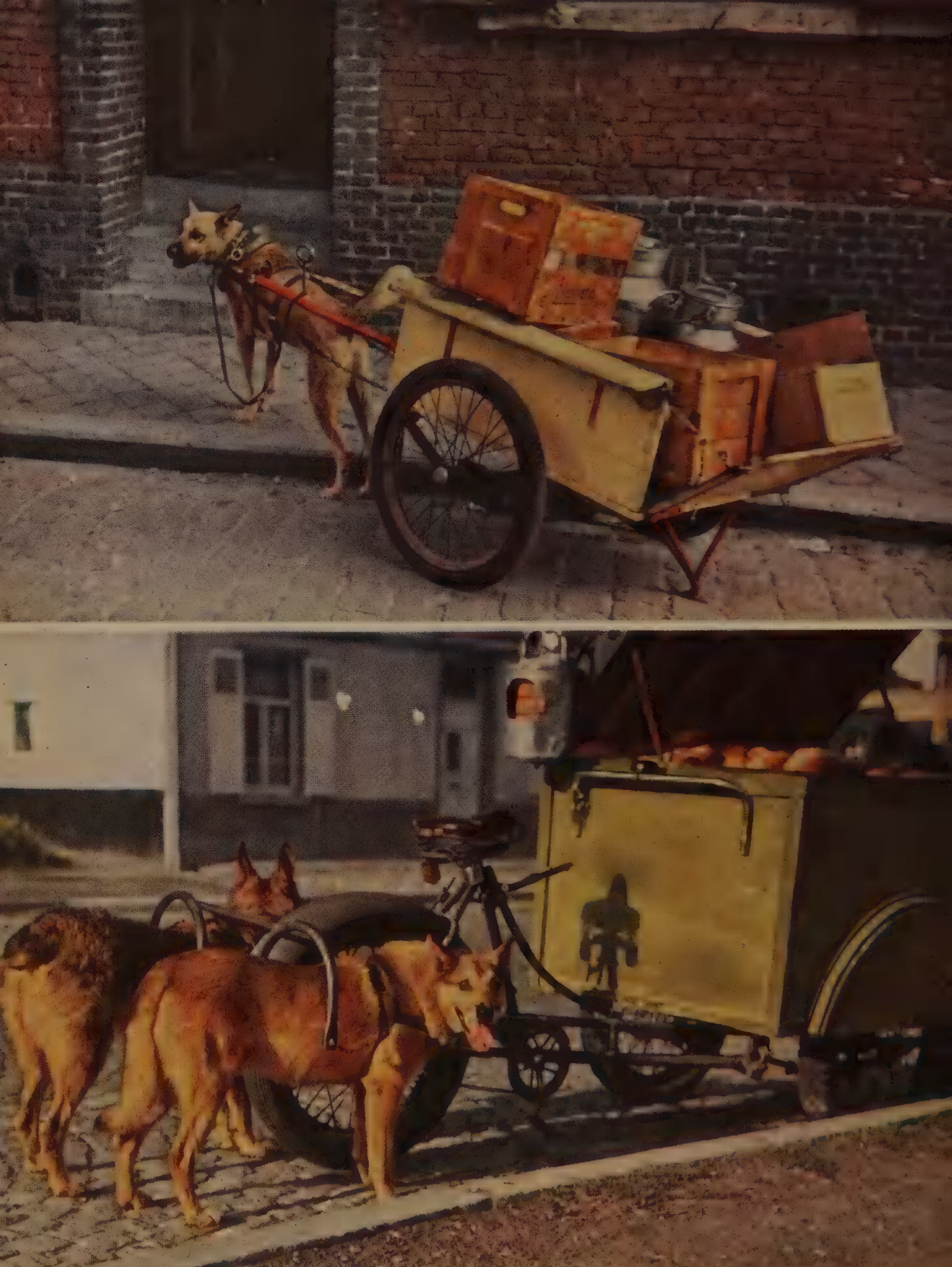
Kodachrome by Maynard Owen Williams



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Kodachromes by Maynard Owen Williams

Belgian Dogs Serve as Auxiliary Motors and Guard Bread and Milk

Such sturdy dogs seem to enjoy their toil. Friendly enough, they become fierce and noisy if anyone touches the goods they watch. When their master or mistress returns, they are eager to share in the hard toil for which Belgian farmers and industrial workers have long been known. Trotting under yokes, the two baker's dogs are pushers not tractors, comrades rather than mere beasts of burden.

© National Geographic Society

Ansco Color by Camera Antwerp

Fine Feathers from Far Peru Are Worn by the Orange-tossing *Gilles* of Binche

When Philip II of Spain visited his Aunt Mary in Binche, the townsfolk decked themselves out in Inca finery from newly discovered Peru. Now these carnival dancers, with Binche lace at their ankles and Spanish lions rampant over their well-stuffed costumes, jingle their way through many a street carnival. *Gilles* is the term for these high-hatted, bell-belted, loud-clogged joy makers.

Belgian Scout Cubs Turn Their Backs on Ice Cream to Look at a Canal

In much of milk-starved Europe, a well-filled ice-cream cart would be the center of attraction.

© National Geographic Society

Kodachromes by Maynard Owen Williams

A Young Scout, Riding an Air Mattress, Crosses a Historic Waterway

Along this algae-green canal, the commerce of the seven seas once came to Bruges. Now a Scout leader uses it as a training spot for his Cubs.

By Cotswold Lanes to Wold's End

By Melville Bell Grosvenor

With Illustrations from Photographs by the Author

"How pleased I am that you are coming to England—and to the Cotswolds! Come and stay with us in our little cottage in this unspoiled village of Leafield, Oxfordshire."

These hospitable words from my old friend Alan Villiers, of grain ship, square-rigger fame, greeted me on my arrival in England.

"You will live in a real Cotswold cottage (a bit tough, but not too bad), and you will sample the English country life of today. We have a nice vegetable garden, a warm attic room, a couple of reasonably house-trained children, and a good welcome for you."

Ask any British naval or colonial officer long in the Far East or Africa what he would like to do most when he retires. Likely he will say, "Give me a cottage in the Cotswolds, with a little garden, a dog, and a pipe."

This tiny region straddling the Cotswold hills west of Oxford is a country all its own (map, page 633). To an Englishman it typifies old England. Little cottages with flaked-stone roofs (page 618) merge into the wolds, or hills, as if they had grown there. Each has its rose garden with ramblers climbing the walls and perhaps blue delphinium, petunias, phlox, and lilies nodding in the breeze.

Even the quaint names of Cotswold rivers and towns caught my fancy. Think of living beside the Evenlode or the Windrush, purling streams lazing beneath great oaks and winding through lush meadows, or calling your home town Chipping Campden, Snowshill, Birdlip, or Lower Swell!

In London I acquired a brand-new 10 hp. Prefect through cooperation of the Ford Motor Company. It was "pocket-size," only 12½ feet long, yet ideally suited to the narrow lanes of the Cotswolds.

All the way to Oxford we drove through beautiful English country gently rolling with pastures and sylvan glades. Set back from the road on hills, fine manor houses like castles peeped through the trees.

Rounding a wooded bend, we slowed for a young couple in shorts, both riding bicycles. Father towed a tiny cycle trailer, Junior fast asleep inside. Mother carried baby's gear on her back. They were a most attractive family.

Bicycles—swarms of them—were everywhere, for it was a beautiful, warm, sunny day, and "trippers" were taking advantage of the weather.

But, as always in England, a shower was just around the corner. When it came, like a flash, the cyclists donned rain clothes. They stuck heads through slits in ponchos and stretched the tentlike coverings across the handle bars. Then they kept on pedaling!

We saw hundreds of such touring groups everywhere in the British Isles. Many rode tandems for two—and even three. The "bicycle built for two" is no Gay Nineties' prop in England today.

Bells Sing Welcome to Cotswolds

Leaving Witney, noted for its Early blankets (Plate VIII), we took to a narrow stone-walled lane. From a hill I spotted the tall thin steeple which Alan Villiers wrote was the guidepost to Leafield. But he had not mentioned the bell music that came floating across the meadows.

As we approached, the din grew. In Leafield green, directly below the church, it was earsplitting.

"Ding, dang, dong, bom, welcome to the Cotswolds," the bells sang over and over.

Entranced, I stopped the car and listened. Townsfolk were gathered beneath the arched gate of the churchyard. All were enraptured by the tintinnabulation.

When I asked a small boy where Mr. Villiers lived, he replied, "The sailor fellow from Australia?* Just demobbed? He lives down there, third cottage on the right."

Slowly I drove down the lane, its stone walls topped with red ramblers. There, in his garden, I saw my salty friend, Alan, with his two youngsters laughing a greeting.

"Welcome aboard," he beamed in his nautical way. "And watch the overheads when you enter—Cotswold doors were designed for dwarfs!"

Inside, Nancie, Alan's charming Australian wife, was waiting for me. For ten days she served as my hostess and, when Alan spelled her at the chores, acted as guide while I explored the Cotswolds.

"You're just in time for some Australian meat pie and black currant pudding," she greeted us. "Put your things down; it's ready."

* See, by Alan Villiers, in the National Geographic Magazine: "Cape Horn Grain-Ship Race," January, 1933; "North About," February, 1937; "Rounding the Horn in a Windjammer," February, 1931; and "Last of the Cape Horners," in this issue.

Gloomy Austerity Ends when the Darts Game Begins in the Fleece, Bretforton

To English countryfolk the village "pub," or inn, is what the corner drugstore or club is to Americans. Here, about 6 o'clock in the evenings, farmers, laborers, the blacksmith, postman—practically everybody—gather for their pint of bitter (light beer) and a bit of gossip and dart playing. This stone-roofed inn, built as a farmhouse in the 14th century and little changed, has been in Miss Lola Taplin's family for over 300 years. Players smile because E. C. Halford has just opened the game with a "double nineteen" and a bull's-eye, 25 points, and still has a feathered dart to throw.

While we ate, Nancie told me how she met and married Alan in Scotland while she was a section officer in the WAAF. When Alan took his LCI flotilla to the Mediterranean and Far East, she bought the Leafield cottage and there began raising her little brood.

"That first winter was a tough one, but the villagers were wonderful and helped me in every way," said Nancie.

Over coffee we could still hear faintly the pealing and clanging of the bells. "Don't they ever grow tired?" I asked.

"No; this is practice night. Teams of bell ringers are rehearsing for next Sunday. They will ring 720 changes. It will take a half hour. Alan, show him up to the belfry, so he can see the men in action."

It was dark in the lane and we had to feel our way. Only one electric light shone in the village green, but the bells kept us company.

"The brownout has even reached Leafield," Alan said. "All over Britain, lights, even street lamps, are cut to a minimum to save coal."

For Nearly 400 Years, Fettiplaces Have Lain Here Stiffly, in Their Armor

Not even the marble elbow pads have eased their long vigil! This powerful family ruled the Swinbrook area of the Cotswolds for 315 years, left funds to its church for quaint charities that are still in force today (pages 620, 621). The town's name goes back to William the Conqueror's day; it is mentioned in his Domesday Book. Originally it was called Swine Brook because pigs watered there, in the Windrush.

As we fumbled around the tower, looking for the door, the bells beat upon our ears. "Tin, tan, din, bom," they sounded over and over. The reverberations stirred me deeply. Perhaps that's why bells are rung; they draw people like a magnet.

Up endless stairs we climbed to a room dimly lit by lamplight. Six men and boys in a circle were pulling and letting go red, white, and blue ropes. Not a head turned as we entered; each kept eyes glued to neighbor's rope. Above, we could hear the bells sounding.

From the group of onlookers a grizzled man came forward, and Alan introduced him as Mr. Arthur Lynes, foreman of the tower.

"Welcome to our belfry! Are you a ringer?" Mr. Lynes asked.

"No, I can't ring a bell," I replied.

"Sorry; good ringers are scarce. We're always looking for a new man to lay hand to a rope."

For a while we stood and watched the solemn-faced ringers pulling and letting go their ropes and sallies (grips).

No one spoke or even smiled. Finally the course, or tune, completed, everyone began talking, congratulating the experts, joshing those who made mistakes.

© Evening Standard

Not until a Chipped-stone Roof Ages 200 Years May a Slater Be Needed

Here, at Filkins, a Cotswold roof man skillfully hangs a flake, or stone tile, to a lath with an oak peg. Old-time slaters can do anything with these slats, curving them around roof valleys and chimneys to make a leak-proof joint without aid of lead (page 635). Largest stones are hung above the eaves, smaller ones near the ridge.

Mr. Lynes explained change ringing, or the hand pulling of bells to sound them, in contrast to electrical ringing, or the use of a keyboard.

"Change ringing originally was peculiar to the English," Mr. Lynes said. "Belgians play tunes on their carillons by striking a hammer against the bell's rim.* But in change ringing the whole bell is swung in an almost complete circle, the clapper striking near the end of the stroke. This swinging of the bell as she —a bell is always a lady—is struck mellows the tone, but makes it stronger, more piercing. Come up to the bell chamber and I will have the big tenor rung for you."

Up a steep ladder we climbed and through a trap door into the cavernous steeple. Six monster bells in a cluster hung from big wheels; ropes led from each through the floor to the ringers' chamber below.

As I watched, the big tenor slowly swung upright, her bronze mouth yawning. I could clearly see the inscription on her side: "Presented to Leafield Church by H. M. Queen Victoria, 1874."

"She is set at the backstroke," Mr. Lynes said in my ear. "Hang on now and I'll give the signal for a handstroke."

"And let me warn you, the sound of the bells terrifies some," Alan put in. "If you were locked up here during a prolonged peal, the concussion might drive you mad.

"In Dorothy Sayers' novel, *The Nine Tailors,* one of the big bells was the murderer. The victim had been tied in the belfry. Old Batty Thomas drove him mad and finally killed him with her bonging."

Suddenly the giant bell rolled over and bellowed a vibrant "Bom." The whole tower jarred. My hands and arms vibrated. Again the bell swung, in reverse this time, the backstroke. Again came the deep "Bom," like a 16-inch gun firing.

* See "Singing Towers of Holland and Belgium," by William Gorham Rice, National Geographic Magazine, March, 1925.

Back in the ringers' chamber another group, including a girl, were set to play "Plain Bob Doubles." This is a simple course usually practiced by beginners.

Change ringing takes months of study before a novice may touch a rope. First he must learn to control his bell, then to sound rounds, or ring the natural chord of the bells, beginning with the smallest, or "treble." Next he advances to simple courses where the order of ringing is changed each time until all possible combinations, or mathematical permutations, are exhausted. For Leafield's six bells, 720 changes can be rung without repetition.

English bell ringing is more mathematical than musical. Notes come tumbling out in steady succession without regard for harmony or melody.

"Bells up and ready for ringing. Stand to your ropes," called the foreman. A youngster, not 14 years old, gave a pull on his sally and then let go. High overhead his bell rang true and clear (page 620).

"Look now, treble is gone," the conductor called. The other five ringers started pulling their ropes in sequence to "sound the rounds."

The bell music continued long after we returned to the cottage. Three hours they played that night. "As long as anyone will pull a rope," Alan commented. "And it's heavy work, too."

"Our house was once a duplex—two families lived under the same roof," Nancie said. "The previous owner cut doors through, making one roomy cottage. Neighbors tell me seventeen lived here a generation ago. Now our family of four occupies it. Many Leafield people moved to the cities to work."

The 300-year-old house, like most English homes, has no central heating with radiators. A tiny wood and soft-coal stove in the kitchen, another in the living-room fireplace—and two-foot stone walls for insulation—keep the home warm and comfortable.

Unlike the true Cotswold cottage, which has no plumbing, the Villiers home boasts a comfortable bathroom on the second floor.

During the evening talk turned to America. Nancie said she had never tasted a mint julep; she had seen pictures of them in magazines.

I offered to make one with a little bourbon I had brought from home. "Let me pick a few sprigs of that fragrant mint in your garden and give me a little sugar and some ice."

"That is nice of you," my hostess said. "But ice? We have no ice here."

"Let's go up the lane and borrow some."

Nancie laughed. "You're in an English village. You won't find ice cubes here. Not a single cottage has a refrigerator."

I was astounded by her answers.

"Ice is so scarce many villagers would not know how to use it," she said.

"How do you keep your meats, milk, and butter?" I asked.

"In a cupboard set in the stone wall."

She opened the door of her "Cotswold ice-box," a niche beside the leaded window. The butter was firm and the milk cool. Temperature is seldom high enough to spoil perishables.

The air is always cool in "windswept Leafield," as villagers call their town. Perhaps that's why refrigerators are not necessary. Hot summer weather, such as is known in parts of the United States, is extremely rare and lasts only for a day or so. During the whole time I was in the Cotswolds I found English tweeds and woolen socks a real need.

Nancie turned Alan and me out in her raspberry and black currant patch. Sitting on the stone wall, we lazily picked the luscious berries she turns into jams and puddings.

That night the rain pattered on the stone roof and the wind whistled. But in the morning the sun streamed in my dormer. Roses in the gardens and the green shutters of the cottages across the way sparkled in the sun.

"What a fine day for color photography," I commented to Alan at breakfast. "Not a cloud in the sky."

A growl from the sea captain. "It always rains in the Cotswolds after a sunny morning. By 10 o'clock it will be cloudy, and rainy in the afternoon." And how right he was!

"Life in a Cotswold village revolves around its church. You must explore one thoroughly; then you will be familiar with them all," my host said.

After a supper of delicious "wet hash"—lamb stew, tomatoes, potatoes, and a bit of ham—the weather cleared and we set out for Swinbrook. With double daylight-saving time, the sun was still quite high.

Down stone-walled lanes we drove, with the sun gilding the cows and Shires grazing in the meadows. Blood-red poppies carpeted the hillsides as in Flanders fields; rose-bay willow purpled the roadside for miles.

Overlooking Swinbrook, sprawled along the Windrush, perched St. Mary's Church. Some of its original stones and pillars were raised in Norman times.

Off the beaten path, this little church was full of surprises. Tacked on the doorway was this welcoming notice penned by the vicar:

> Here no sexton with his keys
> Greedily looks for fees.
> Visitors may stop at leisure
> And may photograph at pleasure.
> Here is dole material bread
> (Giv'n by worthies long since dead).

Bodies Tense, Faces Solemn, Bell Ringers Pull Their Ropes in Leafield Belfry

The boy has just let go the "handstroke," and his colored sally (grip) flies to the ceiling. His bell, the "treble," in the tower overhead, is swinging violently down, wrapping the rope around "her" wheel. If he did not release the sally in time, the pull of the bell might yank him to the ceiling. Man at left is set to "pull off" his bell, cocked upward ready for ringing. Like a hawk he watches the boy's rope and at the right instant pulls his sally, causing the bell to swing down and her clapper to strike a resounding "Bom." Timing is of utmost importance for good ringing. To ringers, a bell is always a lady (pages 617-9).

Around the corner Nancie found a small window with bits of stained glass showing strange-looking figures in brown and gold. An inscription told how a German land mine with parachute dropped between the church and the Windrush on the evening of September 26, 1940.

The explosion shattered windows, displaced roof tiles, but no one was hurt. The vicar carefully collected the broken glass and had it reset.

It was sad to think that the Battle of Britain had touched even this idyllic spot so far removed from the 20th century.

On a wall we saw "A Table of Benefactions" listing many Fettiplace charities.

"In 1743 Sir George Fettiplace gave £2:10s [now $10] A year to repair the Family Monuments in Swinbrook Church, and £3 [$12] A year to A Clergyman for preaching four Sermons in every year in commemoration of himself and his Sister."

In addition, he "gave £13 [$52] A year to be distributed in ten sixpenny Loaves every Sunday among the poor, who must be present at divine Service to receive it."

Could these 200-year-old charities still exist, we wondered. Sure enough, on the vicar's desk we found a stale sixpenny loaf!

Browsing through the church, we were startled by knights in armor, white and stiff, lying on shelves beside the chancel. Each looked as if he had just lain down on his side, with his armor keeping his body straight as a board (page 617).

These were the Fettiplaces, the famous family who owned and ruled the Swinbrook area for 315 years. So powerful were they and their neighbors that villagers roundabout still quote this old rhyme:

> The Traceys, the Lacys, and the Fettiplaces
> Own all the manors, the parks, and the chases.

Minster Lovell's Skeleton in the Closet

Next Sunday we returned and saw an elder hand out sixpenny loaves of bread to the needy. But there was this modern touch: Each parishioner had to put a "BU" (bread unit) in a cup to get his free Fettiplace loaf! Austerity had found its way even to Swinbrook (opposite page).

From Swinbrook we drove through meadows

along the winding Windrush to see Minster Lovell. Nothing is left of the castle but walls and turrets with stairs leading nowhere. Stories told about the old ruin clothe it with mystery that attracts thousands.

Novels have been written about Minster Lovell, the most famous being *The Blanket of the Dark,* by the late John Buchan (Lord Tweedsmuir, formerly Governor General of Canada). The book tells of the adventures of Peter Pentecost, who fought against King Henry VII at the Battle of Stoke in 1487, and, escaping, hid out in the Minster Lovell dovecote.

But the story that draws most visitors to this castle shell is the mysterious disappearance of Francis, thirteenth Lord Lovell, who also fought and lost at Stoke. Escaping, he dove his horse into the Trent and was never seen again.

Many legends grew up about his disappearance, but one held through the years. Lovell was rescued from drowning and hidden in a secret room in his castle by a trusted servant. But this retainer died with the secret, and Lord Lovell was entombed alive.

When repairs were made in 1708, workmen broke into a hidden chamber. Seated at a writing table was a man's skeleton with a dog at his feet. Though it was never identified, many felt that the relic was the great Lord Lovell, who had "starved like a rat."

Next day I took Alan to the station in lovely Ascot under Wychwood. From the brow of a hill overlooking the Evenlode we saw the London train puffing down the valley. I became alarmed that he might miss it.

"Don't worry! Plenty of time. They will hold the train if they see anybody coming," Alan said.

To Keep His Free Loaf, He Must Turn in a Bread Unit

Back in 1743, Sir George Fettiplace left £13 ($52) a year to buy ten sixpenny (10-cent) loaves of bread each Sunday for the needy of Swinbrook's church. But he willed the parishioners "must be present at divine Service to receive it." To this day loaves are handed out, but rationing demands "BU's" in return.

Just before the train pulled out, a girl rushed up on her bike. "Better run, Anne! I will park your bicycle for you," the stationmaster called calmly. She did and he did—an example of Cotswold courtesy.

Driving on, I called upon the author, Mrs. Muriel Groves, in Shipton under Wychwood. Nobody knows the southern Cotswolds better than she. I was pleased that she could accompany me on several motor trips.

"I have lived in Wychwood Forest for 300 years at least!" Mrs. Groves greeted me. "Many of my family, the Hambidges, are buried just outside Swinbrook Church."

In the old days the Wychwood was a large royal hunting preserve. Its trees covered the hills between the Evenlode and the Windrush.

Shipton and Ascot nestled beneath those forested heights. Thus they won their name "under Wychwood."

In the Victorian era Wychwood trees were cut and its lands plowed, until now only a small copse is left.

William the Conqueror loved Wychwood; "Sciptone" is even mentioned in his Domesday Book. King John, local historians claim, built the hunting lodge at Langley, near Shipton. Henry VII stayed there with Queen Elizabeth of York; their initials, H E, can still be seen carved in a bay window of the palace, now a farmhouse. Henry VIII, while hunting here, was presented with a fine greyhound by Anne Boleyn in 1532.

Poaching, Answer to the Meat Shortage

"Shipton old-timers love to tell stories of poaching days in the ancient forest," Mrs. Groves said. "Everyone above 12 was required to respect His Majesty's wild beasts—the hart, the hind, the hare, the boar, and the wolf. Yet all hunted on the royal preserve; fresh meat was scarce. Many a Shipton villager had more venison in a week than a Londoner in a year."

The poachers strung nets between trees and then drove the deer down the "ride" into the nets. Others used trained lurcher dogs to pull down the deer or drive them to the nets.

Cunning places were picked for hiding venison—a hayrick hollowed out, false bottoms in carts, even an empty tomb in the Burford churchyard.

Forest keepers often searched the villages for cooked venison, even looking into "Cotswold iceboxes." On one raid a housewife picked a venison pie off the table and shoved it under baby in the high chair. Keeper left, none the wiser.

Returning home to Leafield, I circled through Charlbury to view the shrunken Wychwood. Beneath great trees I "saw" shadowy poachers stalking deer through the ferns and purple rose-bay that carpeted the glades.

Food is strictly rationed in Britain, so that rich and poor receive the same. Yet country people fare better than city folk. In Leafield everyone has a little garden in which he tries to keep something green the year around.

Old Harry Wiggins was setting out Brussels sprouts when we called on him in mid-July. "Oi loikes Brussels sprouts. They be proper hardy ones, they be," he said.

The plants grow all winter; he picks buds even in the snow. Savoy cabbage, leeks, and broccoli sown in the summer also survive frost and ice and they are "fit to pick in spring if I lev 'em bide (leave them alone)."

Grain for cattle and poultry is strictly rationed. Farmers must turn in all their milk and eggs to Government-approved collectors, keeping only the ration allotment, one egg a week per person.

While I was in Leafield an inspector called on a housewife and asked to see her chickens. He checked the egg production against the number of hens. If she had sold eggs in the black market, her poultry feed would have been cut off and she could have been prosecuted. Fortunately, her egg production checked with the records.

One evening a neighbor told us of her pig club. She and several friends were fattening a hog with their kitchen and garden refuse. Thus they need not buy much feed. But the pig has to be accounted for. When it is killed, a year's bacon coupons must be turned in.

"We took the pig indoors yesterday," she said. For a moment we imagined "porky" running around inside her home!

Then she asked, "Would you like a bit of bacon?"

While I was sending a cablegram home from the post office one day, the young "postie" said: "America is a fine country. When I was with the RAF I hitchhiked from Boston to the West. Even got to the Dakotas—grand country, that! And be sure to see Chastleton Great House."

House Dates to 11 Years Before Plymouth

So, with Mrs. Groves as guide, Nancie and I wound through the narrow green canyons that are Cotswold lanes to Chastleton. The huge manor of yellowish stone and chipped stone roof was built eleven years before the Pilgrim Fathers landed at Plymouth! Yet it is just the same today and is still owned by the Jones family.

We wandered through the spacious rooms, with huge fireplaces, paneled walls, and furniture from the time of William and Mary and earlier.

On a wall we saw the marriage settlement of 1609 between Henry Jones and Anne Fettiplace. Sir Edmund Fettiplace, the same whose tomb and epitaph we admired in Swinbrook's church (pages 617, 620), agreed to pay a dowry of £1,000 to Father Jones *after* the marriage.

The matchmakers evidently knew child psychology—the agreement was made without the knowledge of the youngsters. So the wedding took place and they lived happily at Chastleton, having 13 children!

Pointing to a portrait of a young lady, our

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Kodachrome by Melville Bell Grosvenor

Round and Round, Leafield Children Skip During Recess in Their Cotswold Schoolyard

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II

Kodachrome by Melville Bell Grosvenor

Where Kings Hunted in Bygone Days, Minster Lovell Children Play "Drop the Handkerchief" in a Court Overlooking the Windrush

Beyond stone walls, cattle and sheep graze in meadows carved from ancient Wychwood Forest.

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Rationing Is Tough for Parents but Not for Children

These tots have just finished a hot lunch provided by Minster Lovell school.

Kodachromes by Melville Bell Grosvenor

Mothers Find It Harder to Clothe Youngsters than to Feed Them

Most families pool meager coupons and give rapidly growing children priority.

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Kodachrome by Melville Bell Grosvenor

No Cars, No Petrol, Austerity Rations—Yet Britishers Have Fun on Their Holidays

Here, above Burford bridge, a fisherman reels in to watch canoeists paddle up the storied Windrush. Tiny hamlets, home of friendly folk, straddle the banks of this Cotswold river, "that winds through the rushes." Many kings, including unlucky Charles I, galloped across on hunting forays.

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Kodachrome by Melville Bell Grosvenor

Anglers Avoid Buses in Bridge Niches Where Burford Folk Dodged Thundering Coaches

On this narrow span across the Windrush the great Queen Elizabeth was greeted by Burford aldermen and given a purse of gold. Slender steeple of the parish church pierces the sky above the old Wysdom House, where a man sold his wife for £25 and was paid 15 to take her back!

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Kodachrome by Melville Bell Grosvenor

Sun Peeping Through Blue Rifts in the Clouds Spotlights the Golden Cottages of Great Tew, One of England's Loveliest Villages

On the eastern edge of the Cotswolds nestles this straggling line of thatched cottages of yellowish oölite, or limestone. Wire netting tacked under eaves bars rodents.

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Kodachrome by Melville Bell Grosvenor

From a Five-barred Gate near Burford, Cotswold Children Look Over Smiling Windrush Valley, Some of Oxford's Richest Farmland

Britain is intensively cultivated to grow as much food as possible. On such uplands, once a vast sheep pasture, crops may be a month later than in the lowlands.

Blanketmakers Bowl on the Green in the Garden of Their Witney Sports Club

© National Geographic Society

Kodachromes by Melville Bell Grosvenor

Witney Blends and Weaves Wool from Many Nations to Make Fleecy Point Blankets

Handed down from father to son for eight generations, the mills of Charles Early and Co. first began weaving blankets in the days of King Charles II. Striped duffle blankets, here rolling off a nap-raiser, were the earliest type sent to North America because they "best please the Indians of Virginia and New England, with whom the Merchants truck them for Bever and other Furs." From the marks, called "points," on the edge above the man's arm, Indians could quickly tell the size and value of the blanket. One like this cost four skins at trade.

guide said: "That's Anne Fettiplace in her bridal gown. We took the picture down recently for cleaning. The bride had red nails —there's nothing new under the sun!"

Secret rooms always fascinate me, so I was thrilled when we walked through a sliding panel into a tiny hidden chamber. The guide was not long unfolding its story.

After the Battle of Worcester in 1651, a member of the family fled here and took refuge in this room. Hard on his heels Cromwell's men clattered up to Chastleton and, seeing a steaming horse in the barn, demanded that Mrs. Jones produce the fugitive. They thought him King Charles II himself.

To prove no one there, Mrs. Jones showed them through the house. Not satisfied, they stayed the night and chose above all places the room with the secret panel. Fearing her husband might betray himself by making a noise, Mrs. Jones tried to inveigle the men down to the banquet hall, but they demanded service in that room.

Mrs. Jones sent food up, all right, but she put laudanum in the wine. Soon the men were fast asleep, sprawled on the floor.

"Can't you see little Mrs. Jones stepping gingerly over those snoring soldiers and releasing her husband, who escaped and was never caught?" Mrs. Groves asked.

"Stow on the Wold, where the winds blow cold!" said our lady guide, as we approached a castlelike town crowning a hill. "Roads radiate from it like spokes from a wheel."

Old Stow encloses a hollow square, the market place where cattle were corralled for safety in olden days. Narrow streets led my little Prefect into the court like a gateway. We admired the yellowish houses, the church, and the stocks where prisoners were exposed to public scorn (Plate XIII).

Our road to Upper and Lower Swell was overhung with big trees. It was easy to believe the local saying, "The squirrel can hop from Swell to Stow, without resting his foot or wetting his toe."

To an American the two little hamlets are well named: "swell" is the view as well as the name.

My chief recollection of Lower Swell, besides its church and trim yellow cottages with doorstep gardens, was the sweet scent in the air (Plate XIX). Creamy blossoms carpeted the meads beside the Dikler. With reason the herb is called meadowsweet.

Lower Slaughter is a quiet little village hardly as bloody as its name implies. A tiny brook wends down its one street. Every book I read spoke of the white ducks that sport in its millstream. Sure enough, Pekin ducks were tipping and rippling reflections of rose gardens and cottages (Plate XIX).

A Venice in the Cotswolds

Coming to Bourton on the Water, I was surprised by a miniature Venice. Through the village green the Windrush flows beneath arched bridges. But there is this contrast with the Italian city: Bourton's water is clean and clear, rippling in its shallow bed.

Picturesque as Bourton is, it hardly seems a Cotswold town, because its houses are red brick and its roofs blue slate. The railroad has brought modernity here.

In the vegetable garden of the New Inn, the proprietor has built a miniature Bourton on the Water. So realistic is his toy village that photographs of it are mistaken for aerial views of the town itself.

Every tiny house is built to scale. Even small saplings reproduce live trees, and a Windrush winds through the village. Street lights glimmer, and an organ plays hymns in the church.

Through a periscope visitors get a "villager's view." All is well till a live giant in seven-league boots stalks across the scene!

Near Bourton we turned into a service station, typically Cotswold. Set in a flower border were toy cottages, stone walls, and mushroom-shaped stones, once used to dry grain. Townspeople sat on the stones to watch the servicing of our car.

"Put in 3½ gallons of petrol and check the oil," I said to the smiling attendant, who was dressed in a neat smock.

"Let's see—Maryland or Pennsylvania?" he asked, with a twinkle in his eye.

"District of Columbia," I replied.

"I knew it was close—could tell by your accent. I lived in Washington for 2½ years during the war when I was in the RAF with the British Air Purchasing Commission. Spent my holidays in the Poconos and Pennsylvania Dutch country. How's Georgetown and the Chevy Chase Club?"

Alan joined us on our trip to the west. Our first visit was to old Burford, a prosperous town in the days of the coaches. Travelers moving north and south, east and west, stopped here overnight. Kings and queens of England who have slept in Burford sound like a Who's Who of royalty.

The railroad came and Burford went into a decline. But the motorist brought prosperity again. In summer one has to make reservations far ahead at the Bull, the Lamb (in Sheep Street), the Bay Tree, and at others whose history reflects Elizabethan days.

"Be Prepared" Is Commander Hart's Motto; He Keeps an Antique Gout Stool Handy!

Reclining in the 200-year-old Chippendale wing chair is his nephew, with feet propped up on the frame. It can be adjusted for height and angle and runs on leather rollers. On the walls of his old home on High Street in Chipping Campden this retired naval officer treasures pictures and flags of every British ship, from sail to steam, that he served in (pages 637, 638).

Burford's church is one of the finest in Oxfordshire. Its tower goes back to Norman times, and its history is as exciting as that of Burford itself (Plates IV, V, VII).

Cromwell's men put down a mutiny here and incarcerated the prisoners in the church. On the font we saw a crudely carved name, "Anthony Sedley Prisner 1649."

Roman Roads Are Main Highways Today

We joined the famous Roman road, Foss (Fosse) Way, now a modern highway, at Northleach. Straight and true, over hill and dale it strides. Romans built it that way so guards could keep an eye on long pack trains and gallop to the rescue in case of ambush by hostile Britons.

Not far from Northleach we digressed to see Chedworth's Roman villa, built A. D. 180 but "modernized" about 300-350. Its foundations outline a sumptuous villa enclosing three sides of a square. The caretaker brought the ruins to life with his descriptions of Roman days.

"Do you realize the Romans occupied Britain some 400 years? That's almost as long as the New World has been known," Mrs. Groves remarked. "We are coming now to

Drawn by H. E. Eastwood and Irvin E. Alleman

The Cotswolds, a Bit of Old England, Tucked Away in the Hills above Oxford

Descend the steep western edge of the wolds, and you enter a different world. Yellow cottages with stone roofs give way quickly to houses of brick and slate; even the people are different. Off the beaten path, the Cotswolds remain much as they were three or four hundred years ago when thousands of sheep roamed the downs and wool made the people rich.

Cirencester. It was the Roman town of Corinium, second only to London in importance."

When a street is torn up or a cellar dug in Cirencester, Roman relics, coins, or foundations are often unearthed. Its Roman museum is one of the richest in Britain (Plate IX).

Bibury Trout Prefer Bread to Fly

Bibury lived up to its reputation as "one of the loveliest villages in England." We admired gray cottages reflected in the still waters of the River Coln and the five-centuries-old almshouses of Arlington Row, which draw sightseers from around the world (Plate XV and page 635).

From Bibury bridge we saw fat trout, so old and wise they never rise for fly or worm (Plate XIV). Crusts thrown to them by visitors are their favorite diet. Now, with bread rationed, they often go hungry.

I marked one big fellow on the bottom lazily sculling against the stream; he kept station perfectly. A passing bicyclist tossed in a cigarette butt. In a flash the "sleeping" trout snatched it, then angrily cast it forth.

Small boys fool the fish and their sportsmen elders. They bait hooks with crusts and catch

Before the Lygon Arms in Broadway, the North Cotswold Hunt Gathers for Its Opening Meet — Chase of the Fox Across the Downs

Gentlemen in pinks (scarlet coats) and boots and ladies in riding habits and bowler hats mount their horses, ready to follow the hounds, here awaiting the opening horn.

Lygon Arms has given shelter to travelers for more than 400 years. It was a famous coaching inn for the London-Worcester-North Wales road, which passed down Broadway's wide street, lined with buff-colored cottages. The main section of the inn, where workmen are repairing the roof, was built about 1530, but the front door bears the epic date in American history, 1620.

Many famous people have stayed at Lygon Arms, from Cromwell, who slept there traditionally before the Battle of Worcester, down to the present Queen Elizabeth and the Dukes of Windsor and Gloucester. Thousands of Americans have visited here, too, including Henry Ford, his son Edsel, and grandson Henry (p. 637).

© The Times (London)

Lichen- and Moss-covered, Steeply Pitched Roofs and Dormers of Arlington Row Have Sheltered the Needy since the 15th Century

Cotswold cottages, such as these almshouses at Bibury, fit the landscape so well they seem to have grown there (page 633). And they are a product of the land on which they stand, since stone for walls and roofs was quarried locally.

Chipped-stone roofs weigh many tons, for the largest slats near the eaves may be two inches thick, and they overlap for two-thirds of their length. Roof rafters, formerly hand-hewn, must be exceedingly strong.

Nature manufactures these roof tiles. Blocks of limestone left to winter in the open are split by the frost. These flakes, trimmed and holed, are then ready for hanging (page 618). House builders welcome cold winters, for then roof slats are plentiful; warm winters bring a scarcity.

the biggest ones. But that's "not cricket"!

Following the lovely Coln past unforgettable villages, we came to Fairford. Though noted for its fishing, Fairford is celebrated chiefly for its curious church windows.

Afternoon tea seems a waste of time to most Americans. But I had not been in England two days before I found tea was a necessity; without it I starved!

So we stopped at the Bull in Fairford, for English tea—not just a cup but a big pot of steaming brew—with thin slices of thinly buttered bread and cakes. Tea, with a definite place in the British diet, is provided for in the rationing system.

Walls of the Bull, a rambling hotel, are covered with fishing trophies from its stream. Patrons pay 10 shillings ($2) per day to fish in its private reach of the River Coln.

America seemed far off in the piscatorial atmosphere of the Bull. Yet when I returned to the United States, my son-in-law told me he had trained for four months at Fairford with the U. S. Army Engineers.

"Did you go to the Bull?" he asked. "What wonderful feeds we had there, but we had to be on our good behavior! We were quartered in the Fairford manor house and 'fought' over every field and measured every bridge for miles around."

Like medieval comics in stained glass are the windows of Fairford's church. Walt Disney could draw no funnier figures, nor more horrible, than these blown in glass at about the time America was discovered. John Tame, the wealthy wool stapler who sponsored this sermon in pictures, had a keen sense of humor.

Most celebrated is the great west window, picturing Judgment Day. From open tombs at the bottom the exalted wind slowly up to a heaven depicted in gorgeous ruby and blue. But the damned are whisked off to hell (a glassmaker's oven!) by the most devilish devils imaginable.

Little blue and red demons, dog-faced and monkey-faced, beat the victims (mostly naked women), pitchfork them, and carry them off screaming to hell by wheelbarrow and on the shoulders.

In another window beside the altar Satan is locked behind red-hot bars. "That's where the Devil ought to be, and then we'd have peace," Mrs. Groves said.

Leafield Ringers Play Fast Peal in Farewell

Next day regretfully I said good-bye to the Villiers. I was off to explore the north Cotswolds.

Clear, sharp notes of the bells came jangling across the still air as I drove through Leafield green. From the fast pealing I knew old-timers were showing off to beginners. My friends the bell ringers were giving me a joyous farewell.

Purposely I kept off the main highways, zigzagging across rolling downs to find hidden villages. A favorite was Bourton on the Hill, a hamlet with "window box" gardens. Its yellow cottages and church clung to a steep hillside like barnacles. Squeezed between house fronts and the lane, terraced gardens burst with flowers of every kind.

Suddenly I came over another hill and found myself on a vast green scarp. "Wold's End," local people call this sharp western border of the Cotswolds.

The wind whistled as I walked across to turreted Broadway Tower standing like a sentinel on the brink. Cattle grazed on the slopes around it; behind stretched the green pastures of the highland Cotswolds, once a vast sheep walk or pasture (Plate XVII). Far below reached the lovely Vale of Evesham, its face splotched with cloud shadows, green fields, and many villages and hamlets.

The Countess of Coventry, according to local tradition, built this tower so she could watch her Earl hunt. From its windy summit she kept track of his waving plumes, as he galloped across the downs, to see that he tarried not in tavern or cottage.

Actually, the tower was built in 1800 by the Earl of Coventry to please his wife, who liked to climb to its top and survey his domain.

Many famous poets and artists have spent vacations in this "medieval castle." While they waxed enthusiastic over the view, all grumbled at the long uphill pull from Broadway, the nearest town for supplies.

Farther along "the Edge" we saw at our feet Snowshill, a picture village of golden cottages tucked in a narrow coomb.

Henry Ford, who often visited the Cotswolds, loved Snowshill (pronounced "Snozill"). He bought a farm group here and shipped the cottages stone by stone to Greenfield Village, Michigan.

When the houses were assembled, though every stone and roof flake was numbered, even his most skilled mechanics could not put them together again! Mr. Ford had to send to Snowshill for a stone tiler to hang the roofs.

Dropping down from the wolds by a narrow lane, we passed through Stanway, a famous town of yellow houses and red roses. In a pasture a cricket game was in progress, the players dressed in snowy white. In fact, townspeople were playing cricket in nearly

Close the Side Shutters and a Box Bed Is Tidy by Day, Snug at Night

In old houses, where people passed through one bedroom to get to another, these beds gave privacy. Comdr. Fred Hart, retired from the Royal Navy, sleeps in this 18th-century one from Brittany. His home in Chipping Campden is a living museum; everything in it is an antique. Exhibited are fascinating objects, from the "pottie" rocking chair to the child's slippers shod with little horseshoes (pages 632 and 638).

every village; the game was as common as sand-lot baseball at home.

Making a sharp turn, we literally burst into Broadway. As its name implies, it is one long street, an expanse of lawns and flowers edged with old houses of yellowish stone (Plates XXII, XXIII).

The principal highway from London to Worcester passes through Broadway; so the town prospered as a coaching stop. Its 400-year-old inn, the Lygon Arms, is one of the most sumptuous in England (page 634).

If you are one of those who like to sleep in famous persons' rooms, you can have your wish at Lygon Arms. Reserve in time and you may have the Cromwell Room, where traditionally the Protector slept in 1651. Henry Ford and his family occupied this suite on several occasions.

Many of the British Royal Family have stayed in Lygon Arms, including Her Majesty the Queen. Maj. Gen. Joseph D. Patch visited the inn, too, during the war, for Broadway was in the American training area.

The quiet charm of old Broadway has attracted many American artists. The late Francis Davis Millet had a house and studio in the village, where John Singer Sargent,

Edwin Austin Abbey, and other 19th-century painters visited.

Back atop the wolds, we caught glimpses of a flat-topped tower rising above buff cottages set in a green valley. It was Chipping Campden, "the flower of Cotswold towns" (Plate XXI).

There I stayed with Col. and Mrs. James Hargreaves in their comfortable Cotswold House Hotel.

Everyone smiled a welcome. It was as if the whole establishment was a happy family—the maids, daughters of the house. The servants, from cook to manager, are former service girls—Wrens, Ats, and Waafs. Now they are studying how to run a hotel and the catering business, under Government sponsorship, akin to our GI Bill of Rights.

From my window I looked past chimney pots smoking thin wisps to the grassy hills and patchwork fields above Campden. Below stood the arched wool market and the city hall, the town's center of life. Even swing music floated from the latter when dances were held there in the evenings.

Back in the days when sheep made the wolds rich and famous, Chipping Campden was the center of the wool industry. Success brought prosperity to its people; they built fine homes and manors.

Campden folk cling to tradition; fight attempts to commercialize their town. In fact, Chipping Campden is an English Williamsburg, but with this difference: the houses are originals, not restorations.

With Mrs. Hargreaves I strolled down High Street, window-shopping in the old bay fronts. As houses abutted on the sidewalks, we could look right through leaded glass into front parlors or little shops.

Perhaps grandmother was knitting in a wing chair or a storekeeper arranging bread, sweets, meat, or tobacco in her round window. Shops and homes looked alike, for signs are few and inconspicuous (Plates XVII, XX).

One old house full of antiques especially appealed to us. As we entered, a bell tinkled, but no one greeted us. We were supposed to browse among the antiques undistracted.

I was fascinated by the big bow window which filled the front of the room like a movie screen. Passers-by unaware of us in the depths stopped to peek at the copper coal scuttles, ladder-back chairs, pewter mugs, and brass warming pans. Just like actors on a screen, an elderly couple in tweeds, young hikers in shorts with knapsacks, school children with their book bags, and trippers, all did their little act framed in the bay.

When the proprietor, Mrs. G. C. Pritchard, finally met us and I told her I represented the National Geographic, she said, "I've been a member of The Society for years.

"Come upstairs to my living room. You will be interested, for it was the Wool Staplers' Hall."

In a lofty vaulted room we talked of the old days in Chipping Campden. Here the staplers spread out their wool samples and settled prices before going out to the Market Hall in High Street for a supposed auction (Plate XVIII).

"Prices obviously were rigged or settled in advance," Mrs. Pritchard said. "This hall, by the way, built in the 14th century, is one of the oldest buildings in Campden."

Our hostess ended up serving us tea with delicious homemade cakes and bread, instead of our buying antiques. She had once lived in Washington, D. C.

Many of the old houses in High Street are now owned by British colonial and naval officers who have retired from active service. In one of them Comdr. Fred P. Hart lives exactly as Campden people did hundreds of years ago (pages 632, 637).

Cotswold Games Were Rough and Tough

One day our little Prefect squeezed along narrow, winding lanes to visit Dover's Hill, where in Shakespearean times and later the Cotswold Games were held.

White and blue flowers lined the grassy roadsides. "Cow parsley," Mrs. Hargreaves called the white blossoms. "Most awful weed we've got. And the blue fringe is campion."

Every Whitsun Thursday athletes from all over England came to this grassy knoll to vie in contests rough and tough. They competed in cudgel and backsword play, wrestling, and of course greyhound and horse racing. But toughest sport of all was shin kicking. Opponents kicked each other with their heavy boots until one gave in.

Campden's star shin kicker conditioned himself by batting his legs with a hammer; others trained by whacking their shins with planks. No guards were used, either.

In several of Shakespeare's plays he refers to the Cotswolds, and some of the characters in *The Winter's Tale* speak the dialect of the wolds. Stratford on Avon is only ten miles to the north; so this sheep country must have been familiar to the bard from his earliest days.

As I waved good-bye to my friends in Chipping Campden, Colonel Hargreaves said: "When you come to the steep western scarp of the Cotswolds, with the Vale of Evesham far below, remember that's Wold's End."

© National Geographic Society Kodachrome by Melville Bell Grosvenor

As in Most English Towns, the Church Dominates Cirencester

How to pronounce its name worries its people. Old-timers say "Sisiter." Shakespeare, in *Richard II,* called it "Cicester." Many settle for "Cirencester." The Romans built a large town here, called Corinium.

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Kodachrome by Melville Bell Grosvenor

To Ascot under Wychwood Comes Foster's Traveling Shop, Bringing Pots, Pans, Tools—Anything a Housewife Needs, Except Food

The author met this store on wheels in many villages throughout the Cotswolds. Nearly every household bought coal oil for kitchen stoves.

© National Geographic Society

"It's Nice to See an American Again," They Said to the Author

And just then a Britisher whistled like a GI, reminiscent of U. S. troops who crowded Cheltenham during the war.

Kodachromes by Melville Bell Grosvenor

"Watch the Lorry, Bonzo, While I Deliver This Churn"

Strange to American ears seem many common English words, such as lorry for truck, churn for milk can.

© National Geographic Society

Kodachrome by Melville Bell Grosvenor

In Upper Slaughter, a Well-trained Dog Delivers the Evening Paper

Cotswold roofs are not of slate, but flakes of limestone pegged to wooden laths. Upper Slaughter, crowning a hillside, and its twin in the valley got their names from a giant sloe tree that once identified them (Plates XVI, XIX).

War Removed These Signs to Foil Parachutists. Now They Point to Cotswold Towns Again

"Did you ever play baseball?" the author asked these boys. "Baseball—what's that? How do you play it?"

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Kodachromes by Melville Bell Grosvenor

To the Bookshop Come Villagers on Bicycles to Buy Expensive Cigarettes and Newspapers

Hub of the Cotswolds is Stow on the Wold, "where the winds blow cold." This shop faces market court, scene of the famous Stow Fair. Twenty thousand sheep were sold here in a day when the wool trade was at its peak.

© National Geographic Society

Kodachrome by Melville Bell Grosvenor

Beneath Bibury Bridge, Wise Trout Float in the River Coln. They Await Not a Fly but a Crust of Bread

Lazily the big fellows scull against the stream, a weather eye cocked for a generous visitor. Now, with rationing, they often go hungry. Swan Hotel is a fishing inn.

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By an Old Door in Withington Nigel Bounces His Ball

High hills squeeze the town till it's only a long, narrow street beside the Coln.

Kodachromes by Melville Bell Grosvenor

Woolsacks, Like Fluted Half-barrels, Grace Wool Staplers' Tombs

Bibury churchyard is embowered with roses. Ramblers straggle on walls.

© National Geographic Society

Kodachrome by Melville Bell Grosvenor

Stone Cottages Beside a Still Stream—Such Unspoiled Scenes Draw Visitors to the Cotswolds to Loiter, Fish, and Play—Lower Slaughter

Built of soft stone that hardens on exposure, Cotswold homes have persisted with little change for centuries. Some houses "grow" from quarries on the site.

© National Geographic Society

On the Edge of the Wold Stands Broadway Tower

From its top, 13 counties may be seen, from Vale of Evesham far below to the Black Mountains of Wales, 50 miles away.

Kodachromes by Melville Bell Grosvenor

Bow Window, Delphinium, Picket Fence—Chipping Campden

On rainy days the label over the door gives shelter. The doorway was used as a set for the movie, "Sorrel and Son."

© National Geographic Society

Kodachrome by Melville Bell Grosvenor

To This Arched Wool Market Chipping Campden Owes Its Name

The word "Chipping" derives from the old *ceaping,* or market. Some years ago the owner of the arcade, set in the midst of High Street, planned to sell it abroad. Townspeople presented it to the National Trust.

"Four Ducks on a Pond, a Grass Bank Beyond . . . What a Little Thing to Remember for Years!"

Many authors have thus described Lower Slaughter, a village of gray stone cottages beside a millstream.

© National Geographic Society

Kodachromes by Melville Bell Grosvenor

"Hello! We Like to Play on the Walls. It's Risky"—Lower Swell

Dry stone fences, so familiar in the Cotswolds, mark boundaries and keep cattle and sheep within limits. Since no mortar binds the loose rocks, they fall apart easily. Children often are forbidden to play on walls.

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Kodachrome by Melville Bell Grosvenor

If the Wool Staplers Who Built Chipping Campden Centuries Ago Strolled Down High Street Today, They'd Feel Much at Home

Just as in olden days, butcher, baker, greengrocer display their wares behind bay fronts and mullioned windows. No modernistic stores or bright neon signs here.

Forebears of These Shires Grazing on "the Hoo" Carried Knights in Armor to Battle or Tournament

Now the big animals with shaggy fetlocks are the work horses of English farms.

Nestling in the green valley below is Chipping Campden, with its square-topped Perpendicular-style church looming over all.

When vast flocks of sheep roamed the rolling Cotswold countryside, Chipping Campden was a center of the wool industry. Merchants came from all over Britain and Flanders to buy wool in its arcaded market (Plate XVIII).

Campden's great wealth gained from wool is reflected in the magnificence of its church and the fine old homes that line High Street (Plate opposite).

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Kodachrome by Melville Bell Grosvenor

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Kodachrome by Melville Bell Grosvenor

Since the Days of Capt. John Smith, English Sea Captains and Colonial Men Have Dreamed of Retiring to Such Cotswold Cottages

The naval officer, holding his spaniel, has realized his wish and now lives in the yellow cottage with the garden. It faces the wide street for which Broadway is named.

© National Geographic Society

Kodachrome by Melville Bell Grosvenor

Behind Their Broadway Cottage (Opposite Plate), Comdr. and Mrs. Robert Raikes Enjoy Their Hidden Garden, Where Rock Plants, Roses, and Vegetables Grow

© National Geographic Society

Kodachrome by Melville Bell Grosvenor

Fairford Children Romp in Their Garden Beside a Thatched Cottage

Thatched roofs are uncommon in the Cotswolds today, though older people swear they are warmer in winter, cooler in summer. To fire-insurance companies straw is a menace. Skilled thatchers are hard to find.

Land of the Havasupai

By Jack Breed

FEW of the hundreds of thousands of visitors to Arizona who marvel at Grand Canyon every year realize that in a hidden side sanctum of this mighty gorge a tribe of 250 Indians peacefully farms verdant fields. After the beautiful stream that flows merrily through their canyon home they are called Havasupai (People of the Blue-green Water).*

First record of a visit by a white man to the Havasupai is that of Padre Francisco Garcés in 1776. The Spanish father descended into the canyon about the time of the signing of the Declaration of Independence.

In the latter part of the 19th century several exploring parties crossed the land of the Havasupai, but the tiny tribe remained virtually unknown until 1918 when Leslie Spier, anthropologist of the American Museum of Natural History, lived for several months at Supai and began to study them.

Hard to Find, But Has a Telephone

At Grand Canyon village, on the south rim, few of the National Park personnel could give information on the canyon of the Havasupai—some 35 miles west of the main tourist area. I learned, however, that the road to Havasu Hilltop, beginning of the tortuous 14-mile trail descent into the canyon, was terrible, but that the remote land of the Havasupai had good telephone service!

An easy call from the Grand Canyon telephone office put me in touch with cordial Noble Guthrie, then Indian subagent at Supai, who told me how to reach the land of the blue-green water people. I could either go to the rim on the mail bus on Tuesdays or Fridays, or drive out myself any day.

An Indian guide with pack horses would meet me at the Hilltop if I came in my own car, or I could go out with the mail and continue into the canyon on the mail horses. I elected to drive the 35 miles to Havasu Hilltop (map, page 659).

Before starting, I purchased food supplies at the Grand Canyon store, for visitors to Supai must do their own cooking. For gifts to the "aborigines" I added a sizable box of cookies, candies, cigarettes, and chocolate bars.

The road from Grand Canyon, through Rowes Well, to Havasu Hilltop was far better than I had been led to expect. For the most part, it was an ungraded dirt affair that wound through pine and juniper timber areas, as well as the expansive meadows bordering the south rim of the canyon.

At the 33-mile mark this easy dirt road ended, and the last stage required careful driving to negotiate a twisting, rocky wash. Several dilapidated barns and numerous junked automobiles and wagons littered Havasu Hilltop, the start of the Topocoba Trail down Lee Canyon to hidden Supai village.

John D. Lee, for whom this particular branch canyon is named, was a notorious outlaw of the 1860's who lived for three years with the Havasupai while hiding out after the Mountain Meadow Massacre in 1857.

At the head of Topocoba Trail, where I arrived in half the three hours I had been told the drive would take, I waited for about an hour before shouts and whistling from the canyon depths told me my guide was approaching.

The overhang of the rim and the steepness of the dropoff prevented my seeing more than a few hundred feet down the trail. The shouts continued for more than a half hour before Joe Jones, my Havasupai guide, came into view.

When Joe greeted me with a throaty hello, I was certainly amazed by his appearance. The traditional costume that I was expecting on a member of a remote and untouched tribe turned out to be a pair of tweed trousers given him by some previous visitor, a sweat shirt, heavy boots, cotton socks, and, to top it all, a baseball cap!

His round face, tanned and wrinkled and brightened by keen brown eyes, reminded me of the faces of the Hopi, but his gray hair was neatly cut and parted in barbershop style.

Joe spoke little English, but enough to tell me he'd like to share my luncheon sandwiches. He had ridden 14 miles that morning from the village with no food or water.

Horses Preferred to Mules

Soon he had my camping gear and equipment strapped to the crude wooden pack saddle, and the modern Western riding saddle cinched up for me. With Joe quietly puffing on one of the cigarettes I had brought along and munching a candy bar, we set off down the trail, driving the pack horses ahead of us.

It was interesting to note that the Havasupai use horses and not mules. I asked Joe about this, and he replied, "You train horse early, he good as mule, faster."

* See "Indian Tribes of Pueblo Land," by Matthew W. Stirling, National Geographic Magazine, November, 1940.

Ross Madden

What, No Wires? How Does a Portable Radio Work?

The Havasupai Reservation has two short-wave broadcasting stations and many standard receivers, but these youngsters found the photographer's battery-operated set hard to understand.

At the first turn of the Topocoba Trail I readily understood why I had been able to hear Joe's shouting and whistling so long before I could see him. In the first mile and a half the trail drops a dizzy 1,000 feet by means of 29 switchbacks down a steep talus slope to the floor of the canyon. On the way to meet me it had taken Joe a half hour of coaxing and yelling to drive the weary pack horses up that cliff. This was a new trail, he said, built by hand by the Indians.

The old trail, still clearly visible on the opposite wall of the canyon, had been used as a wagon road by early miners. How they managed to lower their wagons over the brink at the head of the trail I could not ascertain, but the rotted pile of what was once a wooden wagon, splintered on the rocks beneath the cliff, showed they were not always successful.

Seemingly in a matter of minutes, we dropped from the gray and buff limestone of the canyon rim to the brilliant red sandstone of the inner gorge walls. The remainder of the ride, down the creek bed and through countless meanders of the dry stream, became almost boring. Yet whenever I looked straight up I saw the canyon rim seeming to imprison us on either side.

In three hours the red-walled inner canyon began to widen, and lush groves of cottonwoods, willows, and green shrubs began to appear. Suddenly from the base of the canyon wall came the rush and bubble of Havasu Creek.

A closer examination revealed that the water gushes from several springs. By the time we reached the first stream ford, a few hundred yards farther on, the creek had enlarged to a veritable river 15 yards across and about three feet deep—water as crystal clear and sparkling in the Arizona sunshine as I had ever seen.

Red and Gray Walls Half a Mile High

In the last mile before reaching the village we crossed the creek several more times. We now began to ride between neatly fenced fields where green cornstalks quivered in the cool, light breeze. Untethered horses, munching the grass along the stream banks, eyed us curiously as we rode by. Up to this point we had met no Indians nor seen any sign of habitation on the canyon floor.

I was little prepared for my first view of the village of Supai. Weary from more than three hours of laborious riding, I was wondering whether this canyon passage had really been worth while. But on climbing a small rise where the trail enters a narrow cleft between a huge boulder outcrop and the red canyon wall, I promptly forgot the miles behind. There, sprawled below, was the lovely land of the Havasupai (Plate II).

Bright green fields of new corn, winding

William Belknap, Jr.

Spurred Boots and Bobby Sox Adorn the Stomping Feet of Havasupai Harvest Dancers

To their crop festival in late August or early September the Havasupai invite neighboring Walapai, Mohave, Hopi, and Navajo to join in a round of merrymaking. At night men and women clasp hands and, singing in unison, shuffle around a circle to the beat of a drum (page 674).

lanes of sagging willows and cottonwoods, fine orchards, the rich brown of freshly turned earth, and here and there the quaint hogans and cottages of the Indians border the stream bed for about two miles.

Havasu Canyon widens to about a quarter of a mile here, and the brilliant red walls of the inner gorge, which rise several hundred feet straight up above the canyon floor, emphasize the greenness of vegetation. Giving still more color contrast, the gray outer ramparts of the mighty Grand Canyon itself ascend vertically an additional 2,500 feet.

Two towering red pinnacles, which the Indians claim are ancient gods, stood like sentinels on our left. Havasupai legend says that when these rock gods tumble, doom will come upon the tribe (Plate II).

All Modern Conveniences

A few hundred yards ahead of us the dusty trail disappeared into a neat row of cottonwoods which mark the center of the village of Supai. Indians, busy over their crops in the fields or chatting around a hogan, paused to wave to Joe, or just to stare at the white intruder into their isolated homeland.

At the end of the shady "main street" was the little schoolhouse with whitewashed clapboard walls, tiny steeple for the traditional school bell, and surrounding playground of seesaws, swings, and outbuildings. It looked as if it might have been moved here from New England.

At the Subagency headquarters Mr. Guthrie greeted us and led the way to the lodgings he very kindly provided for me. Again I was in for a surprise. Inner-spring mattresses, fresh white sheets, hot and cold running water, electricity at the flip of a switch, tiled bath, and electric fans made me gasp.

Near by were the rambling buildings of the Agency, and across the trail was the home of one of the two white schoolteachers who instruct the Havasupai youngsters. Mr. Guthrie proudly showed me his four electric power plants, radio station, post office, refrigerators, piano, dispensary, and telephones—all brought into the canyon on horseback or by drag.

Joe Jones unsaddled our horses and left me to marvel at his homeland.

"I bring horses tomorrow; we see falls," he told me.

But I replied, "I'd prefer to walk for a change!"

The canyon of the Havasupai is probably best known for its lovely waterfalls. Havasu Creek flows briskly for two miles through the inhabited area of the canyon before it tumbles over five magnificent falls to join the Colorado River several miles beyond. I found the trail to the falls in excellent condition for either

Jack Breed

Higher than Niagara, Mooney Falls Tumble 220 Feet into a Blue-green Pool

At the base of this cataract, under the Grand Canyon's massive walls, the author enjoyed a refreshing swim (page 661). Several miles downstream from the waterfall, Havasu Creek meets the Colorado River.

Drawn by Theodora Price and Irvin E. Alleman

Half a Mile Below the Rim of the Grand Canyon Dwell the Havasupai

Turquoise Havasu Creek, cascading amid red cliffs, has given them their poetic name, meaning "People of the Blue-green Water" (*havasu*, "blue-green water," plus *pai*, "people"). The canyon home of this small tribe is one of the least accessible inhabited spots in all the United States. No wheels can enter it, so steep and rugged are the slopes. Even the mail must come by pack horse. To reach the Land of the Blue-green Water, the author traveled by automobile from the village of Grand Canyon to Havasu Hilltop, then followed the stream-cut canyons down to the reservation by horseback with a Havasupai guide.

walking or riding, and the distance between falls much shorter than I had expected.

The first cascade, called Fifty-foot Falls, resulted from a flash flood that engulfed the canyon in 1932. Surrounded by rich growths of moss and ferns, the creek spills over a broad bench in delicate ribbon patterns.

Several hundred yards downstream, the creek takes a plunge over Navajo Falls, dropping in fan fashion for 60 feet down the colorful travertine.

Another half mile of walking through the dense growth along the stream sides leads to the third and undoubtedly most beautiful of the falls, Havasu or Bridal Veil Falls (Plate I), 110 feet of gorgeous turquoise-colored water cascading gracefully into a sparkling pool. Here I saw at their best the striking colors and glistening waters that give the "People of the Blue-green Water" their name.

Though I had heard that the trail from this point on for the remaining mile to the fourth falls was too dangerous to be undertaken without a guide, I proceeded alone with no difficulty from Bridal Veil Falls through a heavy grove of willows and cottonwoods, where the buildings of a small mining camp still remain.

A silver mine up Carbonate Canyon, which joins Havasu Canyon at the base of Havasu Falls, had been worked some years before, and this was the forge and home of the miners.

Mooney Falls Drop 220 Feet

Passing through this encampment on into the open, cactus-covered canyon floor, I could hear the roar of Mooney Falls ahead of me, but had no idea of their exact location until I suddenly found myself on their precipitous edge (page 658).

William Belknap, Jr.

An Airplane View Reveals the Fertile, Isolated Abode of the Havasupai

Indian village and farms nestle on the canyon floor (center). To reach the reservation, visitors descend difficult trails for hours. Through a side gorge (right center) Havasu Creek flows toward the Colorado River.

Ross Madden

Products of Havasupai Handicraft Decorate a Schoolroom Down in the Grand Canyon

With the help of a white teacher supplied by the Bureau of Indian Affairs, these youngsters learn the proper technique of wrapping a baby on a cradleboard. On the wall are parching trays, gourds, and other utensils. On Saturday nights the schoolhouse becomes a movie theater.

Highest of all, 220-foot Mooney Falls are named for an ambitious prospector who was killed while trying to lower himself over their brink in search of mineral treasures farther down Havasu Canyon.

Later prospectors drove iron ladders into the rocks beside the falls, and today the visitor can lower himself easily through the many passageways and caves in the rocks with the aid of these spikes and some slippery steps cut into the cliffside. The refreshing swim which I enjoyed at the base of the falls with some other canyon visitors was alone worth the journey to Havasu (Plate VIII).

From Mooney Falls a difficult, little used trail winds past inaccessible Beaver Falls to the junction with the Colorado River several miles to the north; but because I wished to return to Supai village for a more intimate visit with the canyon dwellers, I turned back.

Mr. Guthrie told me that the maximum number the land can support comfortably is little more than 200 persons. At the time of my visit there were 35 families with an average of four children each. All the youngsters were required to attend school through the sixth grade. Supervised by Mrs. Guthrie and a regular Government teacher, the school had an enrollment of 40 pupils.

Compulsory attendance has recently been advanced to eight grades.

On Saturday nights Mr. Guthrie showed sound movies in the schoolhouse, and it was indeed a treat to see the major part of the populace turn out en masse to cheer the hero of a western thriller. Whole families showed up early to get good places, and many of the paunchier, older generation had a struggle squeezing into the desk seats.

Even though most of the audience couldn't understand a word of the fast English dialogue in the picture, they had no difficulty catching on to the gist of the story, and ardently cheered or hissed as the occasion required.

I was amused next morning to watch the teen-age braves playing Hollywood "cowboys and Indians" on their horses under the influence of the sagebrush saga of the night before!

Conditioned by their natural environment, the Havasupai are superb horsemen, swimmers, and cliff climbers. It is a common sight to see four or five riding around the canyon

floor on the back of one horse, the father in the saddle and his youngsters hanging on tightly fore and aft (Plate IV).

Tots lead happy, healthful outdoor lives and require few material toys or comforts. I photographed one group fishing for tadpoles in an irrigation ditch, using an empty glass preserve jar tied to a stick for a trap (Plate V).

Whenever I hiked to the falls, I saw shouting youngsters splashing and cavorting in the beautiful stream that flows literally at their doorstep.

Mail trips meant busy times around the post office. Several husky young men usually conducted this biweekly trek to the rim, although it was not unusual for some five-year-old to go along bareback, just for the ride.

When the pack train returned in the evening, there would always be a large gathering near the post office front porch, anxiously waiting to see who or what might come back with the mail.

Visitors Come "By Mail"

Many white visitors come out to the top of Topocoba Trail with the mail, for it saves wear and tear on cars. It is much cheaper to mail provisions to Supai than to hire a private pack horse. I was amused to see the assortment of letters, packages from mail-order houses, boxes of groceries, and picture magazines that arrived on these occasions addressed to such names as Wescogomie, Whatahomogie, Manahaja, or just plain Joe Jones.

Many requests come from ardent philatelists who wish a return letter bearing the Supai, Arizona, postmark. Collectors know it means the epistle was mailed from one of the few remaining post offices in the United States accessible only by horse or muleback.

I noted several different house types. The aboriginal mud and brush hogans, similar to those of the Navajo, are still common. These are used mostly by the older generation of Havasupai, who have not taken readily to the modern houses introduced by the white men.

After one of the several disastrous floods had devastated the canyon some years ago, the Department of the Interior packed in and set up many small wooden cottages. The Indians, however, preferred the dark, smelly interiors of their native hogans, and proceeded to use the cottages for storage.

Gradually young members of the tribe, influenced by the white man's schooling and training, began to move into the cottages, and the younger men and their families now occupy most of them.

To the white man these cottages would seem bare and unattractive inside. To the Havasupai they are luxurious. Some have two rooms, but most have one large room replete with iron-framed spring beds, wooden table, and a chair or two.

Cardboard packing boxes are cut up and used as wallpaper, and the thin wood strips from packing crates are used to repair leaks in the clapboard walls or roofs. The exteriors are invariably painted a brilliant yellow or green or blue.

Joe Jones and his wife lived in a conical hogan, although they also possessed a small cottage which they used for storage. Seeing at least nine pairs of trousers hanging inside, I knew Joe's previous visitors had indulged his predilection for white men's pants.

The pile of blankets and rugs formerly used for bedding on the floor had given way to spring beds. It takes time, but eventually the older Havasupai reluctantly accept these modern improvements.

Joe's wife appeared to be one of the oldest women in the tribe and extremely shy. She hid in the hogan at my approach, and it took a lot of coaxing on Joe's part to induce her to come out. Her face was deeply wrinkled, and her scraggly hair, Dutch cut in front, hung in long, irregular tresses to her shoulders.

Her faded calico dress was in marked contrast to the aboriginal aprons I had been expecting to see at Supai. Ragged cotton stockings and worn shoes completed her wardrobe. Her only adornment was a collection of safety pins proudly displayed across her breast.

I asked Joe if I could take her picture. Instead of replying directly, he entered into a long conversation with her.

"She wants dollar," he finally told me. High finance had come to Supai too!

This surprised me, for none of the other Indians I had photographed had expressed any desire for a monetary reward. They preferred a copy of the finished print, which I was delighted to send them. Though I wished to preserve my friendly relationship with Joe, I took a chance and told him the price was too high. A further conversation ensued, and this time she agreed to let me take a picture for a quarter.

Few Havasupai have any money, and their opportunities to spend it are rare. Knowing this, I asked Joe if his wife wouldn't rather have something else.

The woman giggled slightly for the first time, and said that she'd like a new pair of shoes. My hardest problem was to find out what size she wore. It was not until some months later that I received a letter

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Kodachrome by Jack Breed

Havasupai Indians Live Deep in Arizona's Grand Canyon, near Roaring Bridal Veil Falls

Their tribal name means "blue-green water people." Raiding Apaches drove them to their refuge from former homes along the Little Colorado River and San Francisco Peaks. A 14-mile trail winds from canyon rim to their tiny reservation. Havasu Creek passes through the tribe's farmlands. The Falls' new name is Havasu.

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Sandstone Cliffs, Seamed and Worn by Erosion, Enclose Gardenlike Farms of the Havasupai

The canyon dwellers grow fruits and vegetables on about 175 fertile acres. Though the Government provides cottages, many Indians still prefer brush huts (left).

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III

Kodachrome by William Belknap, Jr.

In a Corral, Brawling Cattle and Broncos Await Tests with Indian Cowboys in the Havasupai Harvest Rodeo

Navajo neighbors rode 165 miles to attend this festival. Havasupai are primarily agriculturists; they own few cattle. To corral even this small herd took hard riding.

A Young Brave Holds Tight for a Bouncing Ride down the Trail

Havasupai are expert horsemen, and children learn to ride almost before they walk. Often a family of four will ride one animal.

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Kodachromes by William Belknap, Jr.

Through a Magic Mirror They See Their Canyon Playground

Havasupai children lead idyllic lives; parents believe that harsh words or cruel punishment shrivels their souls. But they must attend school through the sixth grade.

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Kodachrome by Jack Breed

None of Your Fancy Fishing Tackle for Havasupai Sportsmen

With a jar tied to a string on a stick, they snare tadpoles in an irrigation ditch. Havasupai families average four children, who are reared in the belief that life holds little beyond a happy existence in their canyon home.

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Kodachrome by William Belknap, Jr.

Heads Up! This Havasupai Bronc, Its Rider Tossed, Explodes in a Flurry of Flying Hoofs

The thrown cowboy (right) scrambles to his feet, while others dash for cover. From the corral fence rivals watch. Havasupai horsemen are hard to beat in contests.

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"All Out for the Bronc Riding!" Jim Crook Bawls in Havasu

Prizes go to contestants who stay longest on a plunging cow's or pony's back.

Kodachromes by William Belknap, Jr.

A Cowboy Eases into the Saddle for a Spine-jarring Tussle

In seconds, the Havasupai will be sprawling in the dust or in line for a prize.

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Kodachrome by Jack Breed

Mooney Falls Makes a Giant Shower for Swimmers Frolicking at Its Base

Highest of several along Havasu Creek, it was named for a prospector killed while trying to lower himself over the brink to search below for silver. Visitors climb prospectors' iron rungs to explore caves in the cliff.

from Mr. Guthrie giving the desired information.

Cooking Done Out of Doors

Cooking and much of the other household life of the canyon dwellers are carried on outdoors. I had hoped the clay pot and coiled or twined baskets might still be in use, but I was too late. Modern sheepherder or small iron stoves and well-built stone fireplaces seemed to be in vogue. Metal pots and pans had supplanted the pottery and baskets; and aluminum and porcelain kitchenware littered the campfire area.

Some older women still do make the fine baskets, which may be purchased at the Agency, and parching trays are used in preparing some foods (page 673).

The staple corn is ground with a mano on a metate or pounded with a stone pestle.

Despite the dearth of cattle, strips of beef and venison were hanging from fence posts near the hogans. The meat is first sliced and cured by drying, and then pounded between stones for softening before cooking.

Hanging over a fence near Flynn Wescogomie's house was one of the finely tanned deer hides for which the Havasupai are famous. Hunting, a secondary occupation with the men, is carried on primarily in winter, when the fields lie dormant and fresh snow makes the animals easier to track.

The deer or antelope skin is first dried and dehaired. After being soaked in the stream overnight, it is twisted on a stick until dry again, and finally it is tanned with a preparation of the animal's brain and marrow.

Throughout the process the skin is kept immaculately clean and white. These expertly tanned hides and skins are main items of trade for the Havasupai, and visiting tribes enthusiastically barter for them.

Every morning the Havasupai men and women were busy in their fields, often with several babies propped up near by as an interested audience. Today, as in the past, they are outstanding farmers. They thoroughly irrigate and plant the 175 acres of arable bottom lands in corn, beans, and squash, their staple crops. Delicious peaches, apricots, melons, and figs are grown also in the neat orchards below their farmlands.

At present the Havasupai maintain two dams for irrigation purposes, one above the village and a second in the dwelling area. The main irrigation ditches are one or two feet deep and perhaps three feet wide (Plate V). Smaller connecting ditches divert water to the fields, which are laid out in a simple pattern to facilitate irrigation to all sections.

Joe's fields bordered the trail across from my quarters, and I would find him there soon after sunup every morning, engaged in turning the soil or clearing his irrigation ditches with his modern hoe and shovel. The fields are usually irrigated two days before planting is begun. A small digging or planting stick is used for the latter, and the seeds are evenly spaced along neat parallel rows. The corn ripens in about four months, though it may be picked and used in any stage of ripeness.

Looking up at the canyon walls behind Joe's fields, I wondered about the frequency of floods in this deep gorge, which drains such a vast area of the rim above.

"There have been several bad ones," Mr. Guthrie told me, "but no other so disastrous as the flood in 1911."

In that year a rim-to-rim wall of water 40 feet high washed away the Agency buildings. The terrified Indians took to the cliffsides as the onrushing water, spurred by melting snows and cloudbursts on the plateau above, swept down the canyon, washing away their dams, orchards, and homes.

After the deluge the Havasupai returned to their canyon paradise, rebuilt dams and irrigation ditches, replanted crops, and built new homes. But the older members of the tribe shudder to think of this catastrophe and doubtless still have some uneasy moments during the thawing and rainy seasons.

Havasupai Once Migratory

For centuries the Havasupai followed a migratory life. During the winter they lived up on the plateau of the canyon rim where they had abundant water and firewood and could readily gather seeds and track deer, antelope, rabbits, and squirrels in the snow. They lived in snug huts nestled among the cedar groves for protection against the weather. In cliff caches they kept stores of corn.

In spring, as the snows melted, they returned to the village in the canyon and began their April crop planting.

This semiannual migration has become virtually a thing of the past. Required school attendance for children is one obstacle.

The service flag that hangs in the post office bears 11 white stars for the Supai men who served during the war; and the influences of the war and modern civilization are felt increasingly in this remote canyon.

Some younger men now even leave the village with their families to seek employment at the tourist centers on the rim or in towns near by, though for generations no Havasupai would have thought of leaving his fields to work for the white man above.

Ailing Havasupai "Sweat It Out" in Torrid Steam Baths

To relieve that tired, run-down feeling, the "Blue-green Water People" strip to breechcloths and parboil themselves in the sweat lodge, Havasupai version of the Turkish bath.

Here Lemuel Paya, chief of the tribal council, emerges from a lodge while two companions (left) await their turn.

The lodge consists of a pit covered by tarpaulins or blankets stretched over a willow framework. Rocks are heated (foreground) and carried inside. Bathers sprinkle water on the rocks to produce steam. Temperatures sometimes reach 150°.

Between 10-minute periods of steaming, bathers loll outside, letting sand dry on their bodies. The process is repeated four times; then the Indians leap into Havasu Creek for a cool dip and return to their fields to work with new vigor.

Jack Breed

Deft Fingers of Havasupai Women Produce Baskets for Many Uses

Willow and acacia twigs from the banks of Havasu Creek are woven into vessels ranging from water bottles to large burden baskets, which are carried by means of a head strap (right).

Here a woman (center) works on a boiling basket; others of this type stand on the shelf behind her. Such vessels are made water-tight with coatings of soapweed paste, mescal juice, piñon pitch, and corn-meal mush.

Parching trays, like that beside the woman grinding corn (left), are among the familiar examples of Havasupai basketry (page 671).

On the roof (background) a deerskin dries in the sunlight. The house, of wood and stone, is typical of those which are replacing the Havasupai's primitive brush hogans.

Ross Madden

William Belknap, Jr.

On a Lard-can Drum the Dance Leader Thumps out a Harvest-dance Rhythm

Around him, Havasupai and members of visiting Arizona tribes form a circle, their boots swishing through the sand. The drummer-leader, chosen for his ability to invent festival songs, intones a phrase, and the others repeat it in a low-pitched chant as they dance.

The summer months are still the fullest of the year; and Havasupai, no matter where they are, try to return to the village for the annual harvest celebration, or peach festival, which is held in late August or early September. To this festival they invite the neighboring Walapai and Mohave from the west, and the Hopi and Navajo from the east. Some of the guests ride 165 miles to attend (Plate III).

Rodeo Features Harvest Festival

There are dances in which every one takes part; but today the festival highlight is the all-Indian rodeo in which the various tribes compete. Before the celebration young braves ride far on the plateau rim to round up a sizable herd of cattle for use in the bull-dogging and branding contests. The Havasupai own few cattle and must go beyond the canyon walls to obtain the necessary steers.

Horses for the bronco riding are readily available, since ponies are a Havasupai's most prized possession and each family owns several (Plate VII).

The Indians organize and direct the fun themselves, and the competition is keen and highly exciting. At least one member from almost every family in the canyon strives to do his part to assure a Havasupai victory; and the noisy support of the home folk echoes loudly between the towering red cliffs. Having been virtually bred to the saddle, the Havasupai are hard to beat (Plate VI).

With reluctance I mounted my horse one morning and started back up the 14-mile trail to Hilltop.

Joe Jones whistled and shouted to get the pack horses up the last mile and a half, a rise of a thousand feet, on the Topocoba Trail. At the dilapidated barns we stopped, unloaded, and sat down for a quick lunch which I had prepared before leaving the canyon.

"Is there anything you'd like me to send you, Joe? Something you need badly?" I asked him.

"I like your pants, thank you very much," said Joe, eyeing my Navy khakis.

He was shouting happily at the pack horses again as I watched him disappear down the trail, my trousers *and* shirt neatly tied to the back of his saddle!

Postwar Journey Through Java

By Ronald Stuart Kain

FROM a plane four hours out of Singapore I watched with eager anticipation as the dark-green mass of Java rose from the scintillating sea.

Only five years earlier the Japanese had pounced upon Java as the key to the fabulous wealth of the Indies. Now the island was in the throes of political and social change.

It was an exciting time to visit Batavia, the old Dutch capital, and the surrounding Dutch-held districts, as well as Jogjakarta, the capital of the new Indonesian Republic, and other points in the interior. I had come to gather material for a book on the momentous changes taking place in the Indies.*

Since my Java journey in 1947, the Netherlands and the Republic have agreed to a United Nations proposal that the political future of Java, Sumatra, and Madoera be determined by plebiscite (map, page 682).

Nearly All Whites Are Ex-prisoners

A network of canals, broad avenues, and waving palm trees beckoned our plane down to Batavia's airport. Despite five years of war and revolution, the old city is still a monument to the enterprise and industry of the generations of Dutchmen who built it.

Virtually the entire white civilian population of Batavia, male and female, spent nearly four years in horrible Japanese prison camps. These unfortunates were then interned in the camps for many months longer by the Indonesian Republicans.

Nevertheless, astonishingly few of these people looked any the worse for their experiences. They represented, of course, the strong who survived, while their weaker companions perished or emerged from the camps in such ill health that they had to be sent to the Netherlands or Australia to recuperate.

One of the latter, a tall, friendly old Dutchman from Bandoeng, shared my hotel room one night before taking the plane home to the Netherlands. When he undressed I was shocked to see that he resembled a living skeleton, with only skin and wisps of flesh covering his protruding bones. Months of rest and feeding at Bandoeng had failed to fatten him up, and he was being sent home, probably to die in the arms of his family.

In marked contrast to the relatively well-fed white people remaining in Batavia were many badly emaciated natives. Rice, their staple food, was extremely scarce and costly because of the Republic's economic blockade against the Dutch-controlled cities.

Swarms of naked boys and ragged, half-clad coolies and women of the poorer classes testified to the acute textile and clothing shortage, which is another heritage of the war and the revolution.

There is no better place to see something of life among the poorer city dwellers of Java than in one of the big native markets in Batavia. We set out on a tour of one of these markets one hot Sunday by bicycle chair.

To get anywhere in Batavia except on official business is a headache. Private automobiles are almost nonexistent. Gasoline is strictly rationed by the Dutch authorities. The dilapidated buses and trams can scarcely be seen for the mass of natives clinging to the sides and sitting on the roofs. Taxis are scarce, and those operated by the Dutch must be ordered 24 hours in advance.

Accordingly, one either thumbs a ride on a passing official car (a very uncertain method); takes shanks' mare, which is hard work in Batavia's heat; or succumbs to the temptation to ride in a bicycle chair or a rickety little carriage pulled by one of the tiny, half-starved Indonesian horses.

Bicycle Chair—a Ricksha with Pedals

The bicycle chair is the Indonesian version of the Chinese ricksha. It is a three-wheeled affair with the chair in front. A ragged coolie's bare legs provide the motive power.

One minute after I entered one of these chairs I bitterly regretted my decision. Made to fit the shorter people of Java, it failed utterly to accommodate my lanky frame. I had to double up my long legs like a jack-in-the-box and, even though I sat bowed as if in devout prayer, my bald head bumped against the rough wooden frame of the awning set to ward off the sun's hot rays.

Unwilling to expose myself to the all-too-ready jests of Harry Summers, the Australian news correspondent who accompanied me, I suffered in grim silence until we reached the market some 20 minutes later.

As we approached the jumble of shacks and crude stalls, the crowd thickened and engulfed us in a world strange to a Westerner's eyes, ears, and nose. The tiny stalls, huddled

* See, in the National Geographic Magazine: "The Face of the Netherlands Indies," 20 illustrations from photographs by Maynard Owen Williams and others, February, 1946; "Java Assignment," by Dee Bredin, January, 1942; "Through Java in Pursuit of Color," by W. Robert Moore, September, 1929, and "Traveler's Notes on Java," by Henry G. Bryant, February, 1910.

Pix

All the Spices of the Indies Go into *Rijsttafel*

With mortar and pestle a Javanese cook in Batavia prepares a tangy sauce for Indonesia's famous specialty. At "rice table," beef, pork, goat, chicken, and fish appear in endless variations in times of plenty; a score of waiters may serve 40 different courses. The fiery seasonings are counteracted by copious draughts of beer. Guests help themselves to rice from a huge communal bowl.

together along both sides of narrow, irregular lanes thronged with jostling bargain hunters, offered a variety of articles ranging from rusty, secondhand nails and screws to fly-blown goat meat and American cigarettes.

Crowded Market Ignores Starving Child

Some of the stalls bore mute testimony to the passing of MacArthur's troops through the eastern islands of the Indies. They displayed many articles from U. S. Army quartermaster stores and post exchanges—at prices no one seemed able to meet.

In this good-natured, milling throng I made my first acquaintance with the amusingly precocious child peddlers of Java. Little boys, some of whom looked about five years old, carrying trays of cigarettes, fruits, or tidbits, marched with business-like aplomb through the mob, yelling their wares in treble but stentorian voices.

One little boy we encountered was in an advanced stage of starvation. Slowly and listlessly he half walked, half tottered by, his pitifully emaciated body showing through big holes in the rags that hung about him, his dull eyes pools of misery. No one, including the numerous food venders, paid the slightest attention to this dying child.

I remembered what an old-time resident of the East had told me in conversation the day before: "The East is pitiless to the weak. Human life is nothing."

Yet beggars get help. When a blind beggar, led by two healthy-looking little girls, passed by some of the booths, I saw venders throw dog-eared Republican currency into his wicker alms basket.

At length we found the incessant babble of many shrill voices and the strange pungent stench of the place beginning to pall upon us.

Walking down the street in search of transportation, I spied a fat-bellied, naked little Chinese boy, barely old enough to walk, who was lighting a cigarette from a large match gripped in his baby hand. Hiding behind the outswung door of a ramshackle Chinese store, he was sneaking a smoke. The father, shuffling to the door, shook a finger at his son in gentle, smiling reproof.

Summers and I chose one of the little one-horse, two-wheeled carriages for our return trip. The two of us were barely able to squeeze into the seats, designed for four

natives, that face each other in the rear of this Indonesian one-horse shay. Our combined weight threw the shafts of the carriage so violently skyward that we fully expected the little horse to follow.

Natives Trot Miles with Huge Loads

In sharp contrast was the new Chevrolet in which I made a day's tour of the Dutch-controlled territory along the Batavia-Bandoeng highway as the guest of Dr. Charles O. Van der Plas, adviser on Moslem affairs to the Governor General and a veteran administrator in the service of the Netherlands East Indies Government.

Dawn was just breaking as we drove out of Batavia, and hundreds of candles twinkled softly like hooded fireflies at native market places and food stalls along the road.

Peasants and coolies, naked except for shorts and carrying heavily loaded baskets balanced on pliant bamboo shoulder sticks, trotted by on both sides of the macadam road on their way to or from the city markets.

Watching the shuffling trot of these coolies, I noted its resemblance to the grotesque but rapid gait of American participants in "heel-and-toe" walking races. For many centuries it has been used here as the least tiring method of bearing heavy burdens.

Dr. Van der Plas told me that these short, lithe, steel-muscled little brown men carry loads of 150 pounds or more into Batavia from villages as far as 50 miles in the interior.

Other small groups of coolies were slowly pushing and pulling great clumsy two-wheeled carts loaded with firewood or big bamboo poles. Rarely did we see oxen or the small native horses pulling these ponderous vehicles.

© Screen Traveler from Gendreau

To Market in Baskets Go Pigs from Bali

On a wharf at Tandjoengpriok, seaport for Batavia, a Chinese prepares a slingload of live, squealing porkers for transshipment to Singapore. Thus neatly packaged, thousands of pigs made long sea voyages before the war, with Chinese attendants to feed and water them. Livestock is scarce in Indonesia today.

Every tree in the thick groves along the road bore some kind of fruit, or nut, or provided other food or raw material. We saw sugar, oil, and coconut palms; banana plants; mango, breadfruit, rubber, kapok, and gutta-percha trees, and many others economically useful, including the ubiquitous bamboo.

Chinese Victims of Native Resentment

At Buitenzorg (called Bogor by the Republicans) we slowed down for a look at the impressive palace occupied by the Dutch Governor General of the Indies before the war (page 684), and finally stopped to investigate a ragged crowd assembled in irregular queues before a small office building.

Western Java's Volcanic Peaks Frown upon Tranquil Lake Leles, North of Garoet

Staff Photographer Maynard Owen Williams

Lotus Plants Carpet the Water. Vacation Retreats Hide Behind Lush Tropical Growth

Horace Bristol from Three Lions

For Cool Sleeping in Humid Java, Nothing Beats a "Dutch Wife"

The girls, resting in their bedroom, straddle kapok-filled *rolkussen,* or round cushions (Dutch wives), which absorb perspiration. Netherlanders follow this custom throughout their tropical empire. Even those living in the United States find the bolsters a comfort in summertime.

We discovered that these poverty-stricken people were Chinese, mostly part Indonesian, who had lost their homes and possessions during the war and revolution and were awaiting the weekly distribution of supplies by a Chinese relief organization which received the cooperation of the Netherlands Red Cross.

The shops, stores, and trade of the Indies are almost entirely in Chinese hands. The resentment of the poorer Indonesians at this flared up during the revolution, resulting in terrible massacres of Chinese and in the flight of thousands of others to Dutch-held districts in Java and Sumatra.

From pleasant but war-scarred Buitenzorg the road ascends steeply into the gorgeous mountain scenery of Java's interior.

We met occasional trucks of the Dutch Army careening down the curving road with rugged-looking, khaki-clad young Dutchmen at the wheels. Sturdy, perspiring little peasants swung off the pavement with their heavy burdens to let cars pass.

Farmers Busy in Long-neglected Fields

Occasional tea plantations clinging to the steep mountain slopes showed evidence of long neglect during the Japanese occupation and the subsequent revolutionary disorders. Disruption of intricate irrigation systems had left some of the rice fields dry.

But now peasants were everywhere at work, wringing their meager subsistence from the rich but overcrowded soil. Men and women were bearing golden sheaves of rice home from the fields on the inevitable shoulder sticks.

Deane Dickason

Aspiring Javanese Youth Receives Instruction in an Ancient Art

In this prewar picture the teacher points to chalked examples of floral design used in a school at Jogjakarta, now the Indonesian Republican capital in south-central Java. Such designs appear in bright colors on batiked sarongs like that worn by the instructor.

At one little village the town council was assembling in a rough pavilion, open on all sides, for its weekly meeting. A number of the councilors carried, with obvious pride, battered and bulging brief cases which looked as if they had been through not one but many wars. Here the brief case vies with the fountain pen as a symbol of wealth and importance among unlettered Indonesians.

At the crest of the pass lolled a guard of four young Dutch soldiers. Their pleasant faces and friendly joshing reminded me of American GIs I had encountered in Europe.

Like our soldiers overseas, they were homesick. The lovely scenery, the cool mountain climate, and the relatively easy life they led, now that the sniping at outposts and convoys by Republican guerrillas had ceased, failed to banish their longing for their neat little homeland. Near by were the graves of three Dutch soldiers who had been shot by snipers.

Chickens for Fighting, Not Food

After lunch at the home of the Tjiandjoer district officer and his attractive blond wife, my host left the main highway in search of a school conducted by an old acquaintance, the district's chief Moslem *hadji* (*i.e.*, one who has made the pilgrimage to Mecca).

As we sped along the narrow dirt track, I feared that our visit would sadly deplete the rooster population of the vicinity. The Javanese seem to raise chickens primarily to produce gamecocks, for we flushed many of these magnificent birds from the middle of the

Drawn by Harry S. Oliver and Irvin E. Alleman

Java, Dutch Colonial Prize, Emerged from War Only to Plunge into Revolution

Japanese, occupying Java for three years, encouraged Indonesians to rebel against the Netherlands, which had ruled the rich island for more than three centuries. When Japan surrendered to the Allies, an Indonesian Republic was set up. It comprised parts of Java, Madoera, and Sumatra, with Jogjakarta as capital. Fighting followed, but early this year a United Nations committee obtained Dutch and Indonesian agreement to let a plebiscite decide whether all or part of these territories shall remain within the Indonesian Republic when it enters the Dutch-sponsored United States of Indonesia.

road. They stood there unconcernedly until the car seemed certain to run them down.

Game stock provides the Javanese with one of their greatest pleasures, cockfighting, but offers little attraction to an American who likes southern fried chicken. Javanese chickens are stringy and scrawny, with very little meat on their big bones. Their eggs are about half the size of those of a Plymouth Rock.

The home of the hadji proved to be a clean, well-built, but unpretentious little house with latticework sides to let the air circulate freely. It was set in the middle of a tree-shaded village composed of similar houses, with the inevitable fishpools in which we could see big carp and other fish waiting their turn to round out the sparse fare of the villagers.

The hadji's school was a small one-room house without a vestige of furniture; teacher and pupils sit on the floor with their legs crossed under them.

Three shy but friendly little boys wearing black Moslem fezzes showed us the dormitory where they lived. It was another small one-room house partitioned by latticework into dark little cubicles, each containing a latticework bed devoid of any covering.

Our host, a thin, young-looking man with quick eyes and an intelligent face, invited us to sit on his porch and talk with him. As he unrolled a straw mat, we took off our shoes and sat in a circle in the Eastern fashion, squatting on our crossed legs. His questions and remarks in Arabic, which Van der Plas translated, covered a wide range of world and local affairs, religion, and philosophy. But I was glad when it was time to leave and I was able to straighten my cramped legs.

It was now late afternoon, and reluctantly we turned back to Batavia, where the flickering candles of the market places again greeted us on our arrival after dusk.

I carried back with me an unforgettable impression of the placid flow of village and country life in the Sundanese districts of Java; of clean little houses with neatly swept and sanded yards, half-hidden by flowering shrubs and nestled together beneath groves of banana plants and fruit trees interspersed with fishponds; of a beautiful, fertile land alive with innately friendly little people who smiled and waved at the slightest invitation.

To Jogjakarta, Republican Stronghold

Early the next morning Harry Summers and I boarded the official car on the train to the Republican capital at Jogjakarta, in central Java. We both looked forward eagerly to visiting the territory, which had been under nationalist rule since proclamation of the Republic of Indonesia on August 17, 1945.

Sharing the car were two Republican Cabinet Ministers and other officials who were returning to Jogjakarta after the formal signing of the Linggadjati peace settlement with the Dutch in Batavia several days before, on March 25, 1947. We two, it developed, were the only white men on board.

Less than an hour after leaving Batavia, our train ground to a halt at Krandji, on the perimeter of the Dutch-controlled area around Batavia, where all passengers except those in the official car had to pass a Dutch military and customs inspection.

Sight of a platoon of sturdy Dutch soldiers drilling on the station platform recalled that for months Dutch and Republican troops had faced each other across the frontier, with not infrequent exchanges of small-arms fire despite the truce agreement which both sides had signed the preceding November.

A short distance farther on we stopped again, while Republican officers and soldiers examined the credentials of all the passengers.

Many of the Indonesian frontier guards were scarcely more than boys, and most of them were so short and slight that their rifles looked much too heavy for them. Attired

© Screen Traveler from Gendreau

Floral Wonders Surround the Governor General's Snow-white Palace at Buitenzorg

Victoria water lilies, with pads like floating piecrusts, and lotus plants adorn the reflecting pool. Japanese scientists used laboratories of the adjoining Botanical Gardens during the 3-year occupation of Java. The mansion, neglected during the war and the ensuing conflict between Netherlands and Indonesian Republican forces, recently became headquarters of the Dutch garrison of Buitenzorg, 30 miles south of Batavia.

and equipped with a bewildering variety of uniforms and arms, most of which appeared to be of Japanese origin, they slouched and swaggered about the platform, apparently enjoying their military role.

Long Hair a Badge of Patriotism

A few youths here, as in many parts of the interior, had let their hair grow long to fulfill an oath taken early in the revolution not to have it shorn until independence was won. For a foreigner, it was hard to tell whether some of these "long-hairs" were boys or girls.

An efficient-looking functionary, indubitably a girl, inspected the credentials of all who alighted from the train. The guards and the girl, I was informed, were among numerous students released from their studies to help keep governmental services running.

All morning our wood-burning locomotive with its Indonesian crew pulled us at a fairly good speed across the great coastal plain of Java, rice bowl of the Netherlands Indies. Green, flooded rice fields stretch to the sea on the north and to the rugged mountains looming on the southern horizon.

Immense labor is involved in planting and reaping such a vast area, since each stalk of young rice is pushed into the soft muck singly by human hand and cut by hand when it ripens—exactly the same way it was done two or three thousand years ago.

Fishing in a Rice Field

Occasionally we saw a fisherman standing motionless with bamboo pole extended and a heavy string dropping down into the nearly full-grown rice. The crop largely concealed the stagnant water, which is very shallow but nevertheless contains small fish that form a welcome addition to the peasant's almost exclusive diet of rice and fruit.

Now and then we saw country folk bathing naked in the muddy, crocodile-infested rivers.

Water buffalo were numerous here and almost invariably accompanied by boy herdsmen clad only in breechclouts. Whether grazing along the railway or wallowing in mudholes or streams, one animal in each small herd usually had a sunburned boy astride its broad back.

Later the President of the Republic, Achmed Soekarno, told me something about the habits of the huge creatures, with their great curved horns, which drag the ancient wooden plows of the peasants through the muck of the rice fields. The water buffalo, he said, is normally gentle and docile, but becomes infuriated and dangerous if the peasant tries to force it to work after 11 o'clock in the morning, when the sun's nearly vertical rays make it long to seek refuge in water or deep mud.

During stops at stations along the way we tried several varieties of fruit, including the delicious mangosteen with purplish husks protecting the succulent pure-white pulp within; also big green coconuts which squirted their cooling, astringent juice like a tiny fountain when a small boy expertly chopped out a small hole from which to drink.

But some of the "delicacies" pressed upon the willing native customers by the peddlers made my stomach quiver just to look at them —roast chicken, cooked dried bananas, goat meat, rice patties, and so forth, scorched in the tropical sun and powdered with the dust and soot of many passing trains.

Once in a while pitiful beggars in indescribably filthy rags, their bodies covered with sores, would evade the railway guards and raise little baskets pleadingly to the passengers. There has been a marked increase in syphilis and tropical sores throughout Java because of the breakdown of the prewar Dutch public health services and the lack of medicine.

Ancient Capital of a New Republic

It was dark when our train, after climbing all afternoon onto the uplands of the interior, panted into the station at Jogjakarta. The station was a tumult of pushing, perspiring Indonesians, hundreds of whom alighted from the tightly packed wooden passenger cars, while hundreds of others, bound for stations farther along the line, fought for a place to sit or stand.

Preceded by a young official of the Republican Foreign Ministry, we pushed our way through the mob to a pint-sized British car. Almost new, it was one of a few recently imported through the port of Cheribon. Practically all of the cars in the interior were

Lillian Schoedler

Wearing an Ornate Javanese Kris, He Stands Guard at the Sultan's Palace

This court attendant's chief is the Sultan of Solo (Soerakarta). Sarong and shiny stiff hat are his usual costume; he covers his bare shoulders with a jacket only when leaving the palace.

Three Lions

A New Look Results when East Meets West

This Soerabaja businessman, weighing cool comfort against the dictates of fashion, compromises between Javanese and European dress. Over his flowered sarong and open-toed sandals he wears Western-style clothes and sun helmet. Bicycles are a popular form of transport in less hilly parts of Java.

of prewar vintage. That the Republicans managed to keep them operating without spare parts and with an extreme scarcity of tires and inner tubes was a tribute to the efficiency of their mechanics.

The little car bore us smoothly along the main street of the Republican capital to the administrative palace of the Sultan of Jogjakarta, Hamanjkoe Boewono IX, where we were assigned a room opening on a secluded and peaceful court.

As we ate from the Sultan's expensive silverware on the veranda, we watched a score of small lizards crawling along the ceiling in search of insects and occasionally scuttling down the wall on suction-cupped feet to gaze curiously at their funny-looking white-skinned visitors. At intervals during the day and night these lizards send out the loud, grating cry which gives them their name: "geck-o, geck-o."

A day or two later we had the privilege of an interview with the charming, democratically minded young Sultan, who is both hereditary ruler and governor of the Jogjakarta district under the Republic and who holds other high offices in the government and the army of the Republican regime. Educated in the Netherlands, he has modern ideas and attempts to rule through a democratically elected legislative council.

Western Garb Replacing Javanese Dress

Here, as elsewhere in Java, most of the men and boys of the educated classes have cast aside the traditional and highly colorful Javanese costume—batik sarong, long-sleeved jacket buttoned at the neck, batik turban, and no shoes—in favor of informal Western attire—sport shirt, shorts or trousers, *and* shoes.

Except on formal occasions, when they revel in their beautiful Javanese costumes, the schoolgirls and higher-class young women dress very much as their sisters in America or western Europe.

Seeing these neatly dressed modern-looking boys and girls riding their bicycles with carefree self-reliance down the crowded streets, you have to pinch yourself to realize that you are in one of the most ancient capitals known to the recorded history of the Indies.

But heavily mixed with the modernity of Indonesian youth are figures and faces representative of a dying feudal age—the half-naked peasants, ragged peddlers, and street urchins squatting or sleeping on the sidewalk

in the shade, the women of the poorer classes in cheap, dirty-looking batik sarongs, the naked children.

Most depressing of all are the women coolies, who in this section of Java are horrible victims of that ancient, primitive male slogan: "Let the women do the work." Dressed in nothing but ragged gunny sacking or ill-fitting straw matting, these wretched women shuffle through the streets, bent almost double under sacks of rice or other goods and with a look of anguish and hopelessness in their dull eyes.

Slogans from American Revolution

Many of the bare walls in the center of the city were still adorned with weather-beaten propaganda slogans painted by Javanese nationalists just after the proclamation of the Republic in 1945, when they expected that American troops would be sent to Java to accept the surrender of the Japanese occupation forces.

Many of these slogans had been copied or adapted from the patriotic utterances of American patriots: "Give Us Liberty or Give Us Death," "Freedom Forever," "Unity and Independence," and so forth.

One of the young Indonesian officials assigned to guide and assist us was Johnny Senduk. Johnny at once attracted my attention by the frequent American slang expressions that crept into his fluent English. He is a Christian from Manado, in northern Celebes, who had gone to sea in search of adventure and, like many Indonesian seamen, had jumped ship in New York. He lived unmolested in Brooklyn for several years, acquiring an inordinate taste for American swing music and soft drinks and a deep admiration for America as a country.

R. Brandt from Black Star

Mother and Child Pause for Lunch on a Javanese Rubber Plantation

In addition to rearing families, thousands of Indonesian women hold full-time jobs on estates growing rubber, sugar, tea, coffee, cinchona, and other valuable export crops. Many plantations provide barracklike nurseries where the infants sleep in hammocks slung from the ceiling and are cared for by trained attendants.

Wartime conscription resulted in the discovery of Johnny's status as an illegal immigrant and he was deported. Now he divides his time between writing poetry, editing an English-language magazine published by the Republic, and taking care of inquisitive foreign correspondents and writers.

Whenever Johnny can spare an hour or two from his varied activities, he goes with other local hepcats to an ice-cream bar in Jogjakarta where tasteless ice cream is served to the accompaniment of hot jazz music from a well-worn collection of American records.

One sunny afternoon Johnny took us on a tour of the Sultan's residential palace, in another part of the city.

Alfred T. Palmer

Stubby Spires of Boroboedoer, Java's Buddhist Shrine, Frame Slumbering Mount Merapi

Each of these three bell-shaped stupas, like hundreds of others studding the massive temple near Jogjakarta, contains an image of Buddha. On the walls, more than two miles of carving depict the religious leader's life in detail. Boroboedoer was built about A. D. 850. Dutch rulers of the Indies began excavation and restoration of the ruins about a century and a half ago (opposite page).

The Sultan rarely visits this palace, preferring the simpler and more modern atmosphere of his administrative headquarters. So the palace is maintained largely as a matter of tradition and routine by a hereditary corps of officials, guards, and servants.

Passing through the outer gate was like entering another world—a world of peace, refinement, and quiet dignity, of harmonious blending of line and color—but also a world clinging with a sense of its own futility to a dying tradition and an outmoded civilization.

The entrance to the inner court was guarded by two huge pot-bellied statues, sitting alert with drawn weapons, presumably to scare away evil spirits. An equally amusing human guard, a little, wizened old man with a wispy gray mustache, stood holding a long spear with the butt resting on the marble floor.

The tip of the spear, it turned out, is still kept poisoned, in line with ancient tradition. But it seemed extremely doubtful whether the old man could hold the weapon if he attempted to level it at an intruder.

A Really Old "Swimmin' Hole"

From the residential palace we drove by carriage to the ruins of the Water Castle, the ancient court of an earlier line of rulers.

Wandering along a tree-shaded lane in the vast grounds of the crumbled palace, we were attracted by splashing and childish shouts to a really old "swimmin' hole" that would be the envy of almost any American boy. Naked youngsters and a few of their elders were plunging joyfully into a great weed-grown pool in which the rulers of Jogjakarta and its domains had disported centuries before.

Long ago the palace boasted a broad lagoon dotted here and there with impressive stone

pavilions. But now the lagoon is dry and its level floor is crowded with the houses, gardens, and fruit groves of modern Javanese. Here, as everywhere in Java, we saw many naked babies and swarms of older children.

The crowded bed of the lagoon is one of many illustrations of the island's grave problem of overpopulation. There are now around fifty million people dependent almost entirely upon agriculture for their livelihood on the island of Java—a population denser than that of any industrialized country in western Europe.

The Boroboedoer Still Glorifies Buddha

On another afternoon Johnny obtained possession of the British bantam car and took us to visit that crowning monument to the ancient Indian civilization of Java, the Boroboedoer.

An hour's drive through the ever-entrancing Javanese countryside brought us to the world-famous Buddhist shrine, which was discovered buried in a huge mound of rubble and excavated and restored by the Dutch rulers of the Indies. As we approached, we could see it from a distance, crowning a solitary hill near the end of a great valley encircled by rugged mountain ranges.

As our car ascended the hill and stopped, the massive size and fabulously ornate decoration of the temple inspired awe. The largest cathedrals of Europe, although more graceful and with much higher spires, would nevertheless look puny and insubstantial beside this 1,100-year-old marvel.

The hoary structure rises like a terraced pyramid with truncated corners from a base that would fill a good-sized city block to a great bell-like dome surmounted by a spire that looks as if it had been chopped squarely off not far from its starting point.

Gazing up the sides of the structure, you see everywhere the benign, impassive face of the Buddha staring at you or beyond you with an expression of timeless wisdom.

On the upper terraces the glorification of the Buddha takes another form. Each terrace is fringed with regularly spaced heavy stone screens, each a miniature replica of the huge bell-like dome (opposite page) and each containing in its hollow interior an identical statue of the Buddha seated with his hands folded, palms up, before him.

I noticed Johnny, with his arm stuck through one of the openings in a screen, straining to touch the hand of the meditative figure inside.

"If you touch the palm of the Buddha and make a wish, it will be granted to you," he explained. And then, succeeding in his quest, he grunted: "I wish, I wish I could find me a nice girl friend."

A few days later Summers and I were invited to accompany President Soekarno, Vice President Mohammed Hatta, and a number of other Republican officials on a four-day tour into western Java.

The trip reminded me of a Presidential campaign tour in America, except that here the people gathered to greet their leaders as champions of Indonesian independence rather than as leaders of a single political party.

The heady wine of freedom and democracy, I discovered, has imbued large sections of the population with nationalistic fervor and a feeling of exhilaration. Under the influence of Soekarno's personality and oratory his followers are apt to exhibit symptoms resembling those of champagne bibbers.

I am sure that Soekarno could teach a few tricks to the best of our American politicians on how to get right with the voters. Crowds were assembled at every railway station to cheer and salute the President.

"Mer-dek-a, mer-dek-a, mer-dek-a!" (Freedom, freedom, freedom), the crowd shouted in an endless chant, right arms held upward in salute.

At one typical stop a chorus of dark-eyed, serious-faced little schoolgirls lustily sang patriotic songs, one of which was set to the tune of our "Battle Hymn of the Republic."

The Sundanese people of western Java differ markedly from the Javanese inhabiting the central and southern districts. They are sturdier, hardier, gayer in spirit. Their women are more beautiful and more colorfully costumed and their traditional dances more vital and impetuous.

White Skin an Oddity Here

In the Republican territory of western Java a white-skinned American is the object of a curiosity which sometimes becomes embarrassing, for my Australian companion and I were informed that we were the first white men to enter this region since the early days of the 1945 revolution. Since Dutchmen and other Europeans who lived here before the war had spent the war years in Japanese prison camps, many of the native youngsters had never seen a white person.

Schoolboys and girls goggled at my ruddy, sunburned complexion tinged by the strange yellowish glow induced by taking atabrine tablets, and I noticed one group of small girls giggling delightedly at the cue-ball-like glisten of my bald pate. My height of six feet two astonished them, as the average

Deane Dickason from Ewing Galloway

Java's "Sand Sea," an Old Volcano Crater, Suggests a Landscape on the Moon

This lake of ash, in a depression between mountain walls near Soerabaja, was once a seething caldron of lava. Up the cement steps (foreground) visitors climb to peer into the roaring furnace of Bromo, an active volcano.

Staff Photographer Maynard Owen Williams

After a Round of Batavia's Shops, She Boards a Bus for Home

The sarong-clad woman (foreground) lifts a load of goods obtained by bartering produce of her outlying farm. The bus waits at a station on the colonial capital's main street beside the Molenvliet Canal. All Java now suffers from an acute shortage of transport (page 675).

Indonesian seldom stands more than five feet and weighs about half as much as a good-sized American or European.

Many of the schoolgirls are inveterate autograph hunters. They respectfully but firmly demanded not only autographs but messages for the little girls of Indonesia.

Since English is taught as the secondary language in Republican schools, some of these girls tried out their English on me, and I could not help admiring their proficiency. As we were about to leave Tasikmalaja, a bright-faced girl of about ten years handed me the following note:

Honourable Sir:

May we take the liberty to ask you if you will send us a copy of your impressions of Java and his inhabitants.

We hope you will not refuse this sincere desire of us.

Please, be so kindly as to convey our best wishes to the American girls.

Receive our thanks.

With kind regards,
Ann Soediadinata
Etty Kartamihardja
Garmini Soeria Danveningrat

Early dawn of the second day after our return to Jogjakarta found me, with an Indonesian companion, waiting at the jam-packed station to catch the train back to Batavia.

As luck would have it, the entrance to a first-class coach stopped right in front of me and, hanging desperately to my bags, I was swept on board by the swirling mob.

Train Packed Like New York Subway

Every available seat was already filled, so there was a rush for the next best positions, a perch on the arm of a seat or a suitcase.

Perspiring passengers kept pushing in until the car was jammed like a rush-hour express on the New York subway. We had to put up with such crowding for most of the 14-hour journey to Batavia.

The Indonesian children in our car were pure gold. The little Javanese baby boy in the lap of his peasant mother, who sat on the floor of the aisle beside me, sucked contentedly away at his harassed mother's ample breasts and never let out a peep the whole day. He amused himself by pulling the hair on my bare arms, and when I patted his

Netherlands Information Bureau

Symbol of Vanished Glory Is a Javanese Sultan's Gold-encrusted Coach

Here the Soesoehoenan of Soerakarta rides forth in his carriage, surrounded by servants in royal trappings. Even under prewar Netherlands rule the Sultan's power declined; now, with his territory in Indonesian Republican hands, it is almost nonexistent. In past years the Sultans of Soerakarta and Jogjakarta were Java's most important native leaders.

tiny hand his barefooted mother and father gave me the most heart-warming smiles I have ever received.

Lunchtime, which began early and ended late, meant a wild scramble by chattering members of the respective families for food packages stored in sacks or valises scattered all over the car.

Those of us who carried no lunches had to depend on the food venders at occasional stations. The difficulty was that it was virtually impossible to squeeze one's way out onto the platform even if one wanted to take the risk of losing his precious seat on the hard arm of a chair.

The windows of the car opened just wide enough to admit a man's flattened hand, but the peddlers managed to squeeze through some boiled duck eggs, also tiny oranges and other small fruit, and we subsisted on these.

"No Time for Climbing Mountains"

My Indonesian companion and a number of other youths who had fought in the Republican armed forces, first against the Japanese and then against the British-Indian troops who landed in Java to accept the Japanese surrender and rescue Allied internees, engaged me in conversation.

Their facility in our tongue was certainly a tribute to the thoroughness of the prewar Dutch educational system.

These youths showed great interest in American foreign and domestic affairs, and I discovered that they listened regularly to the "Voice of America" broadcasts from our west coast in both English and Malay.

One young veteran told me that it was his life's ambition to attend West Point and asked me whether there was any possibility of an Indonesian youth being admitted.

Towards evening, as we were crossing the great rice fields of the Cheribon plain, the sheer peaks soaring into the blue sky of the distant interior again attracted my attention.

"If some of our American mountain climbers saw those peaks, they could not resist an attempt to scale them," I remarked to my young Indonesian companion.

"We have no time for climbing mountains," he replied. "We have many more important things to do."

Soibelman Syndicate

In Gay Racing Harness, an Entrant in Madoera's Bull Derby Gets a Last-minute Grooming

Big sporting event of the year on this island, off Java's northeast coast, is the September bull derby at Bangkalan. Teams of animals, aristocrats of the island's herds, sprint before howling holiday throngs. Breeders adorn their bovine speedsters with fancy headdress, bells, ribbons, and tiny mirrors. Horns are painted or encased in knit wool. Umbrellas shade the bulls as they await post time.

All Madoera Turns Out on Derby Day; Seats in Trees Are Free

From lofty perches these islanders shout encouragement to their favorite bull teams as they gallop around the *alun-alun*, a grassy square in the center of Bangkalan, which for a day becomes the Indonesian counterpart of Churchill Downs.

Every Madoera village is represented by one or more teams which qualify for the derby in smaller meets held on preceding Sundays.

Villagers back their entries with an enthusiasm which frequently leads to violence. Owners of losing bulls, overcome by rage and disappointment, sometimes slaughter the offending animals on the spot and sell the carcasses to butchers.

Dorien Leigh from Black Star

Central Feature News

Down the Stretch Thunder Two Teams of Racing Bulls. Jockeys, Crouching on Sledges Between the Yoked Animals, Urge Them On

Admirers Surround Three Jockeys, Who Await Their Turn to Race

After a year of training and practice in minor village meetings, these racing-bull drivers (foreground) hold themselves in tense readiness for the derby at Bangkalan.

Bulls usually are driven by their owners. Each guards jealously his secret training methods. Derby victors win public adulation like that accorded a baseball hero in the United States. Defeated owners return home in virtual disgrace.

The drivers here wear their "uniform" of knotted kerchief, heavy leather belt, and wide pantaloons.

The fez, a popular form of headgear in Indonesia, predominates among the admiring youths. A few wear turbans, while one (center) proudly sports a sun helmet.

Dorien Leigh from Black Star

Young and Old Railbirds Reflect the Gaiety of Derby Day

"What cockfighting is to Bali, so is bull racing to Madoera"—so goes an Indonesian saying. And next to owning and racing a thoroughbred team, the Madoera villager's dream is to see his favorites compete for the crown at Bangkalan.

Neglected for the day are Madoera's rice fields, coconut groves, and salt deposits. All roads on the island lead to the races. Swelling the throng are additional Javanese enthusiasts who cross on the ferry from Soerabaja.

Derby festivities start with a parade of the gaily decorated favorites. Venders hawk their wares among the spectators. Owners of competing teams address the crowd, praising their animals and heaping scorn upon those of rivals. Bookmakers do a lively business.

Erwin Berghaus

Dorien Leigh from Black Star

They're Off! Heads High and Muscles Straining, a Team Starts a Wild Dash for the Finish Line

The driver wields his short club furiously as the matched bulls break from the barrier and head down the track in quest of derby honors. Two European visitors (in white), who have strayed into the Bangkalan arena, hastily scramble out of the way.

© A. P. H. Last

Like an Angry Brown Demon, a Driver Flogs a Derby Team Past the Bangkalan Grandstand

Dorien Leigh from Black Star

The Winner and New Champion Tells How He Achieved Glory

Following derby day custom, this winner of a race at Bangkalan mounts the withers of one of his bulls to make a speech. With pantomime and oratorical flourishes he discusses his animals' pedigrees and describes his training methods. Among his defeated rivals may be some with broken bones, for jockeys frequently fall from their perches on sledges dragged between the yoked bulls.

During their three-year occupation of the island the Japanese banned bull racing and also bull fighting, in which two animals prod each other until one runs away. Many bulls were slaughtered to feed Japanese troops. However, bull sports were conducted secretly.

The first big race meeting since Japan's surrender was held a few months ago. A Madoerese, say the islanders, often values his bulls more than his family. He bathes them daily, supplies them with choice fodder, and is ever ready to proclaim their superiority. The best are trained for racing or fighting; the others are shipped abroad.

Before World War II Madoera exported about 60,000 bulls annually. Cows are used mainly as draft animals and for producing more bulls.

Last of the Cape Horners

By Alan Villiers

IN DECEMBER, 1947, the four-masted bark *Pamir* sailed into the Thames estuary, furled her 40,000 square feet of canvas, and took a tow to London docks.

Sailing out of Wellington, New Zealand, the 43-year-old *Pamir* had accomplished the passage in 81 days, which is good time. Across 15,000 miles of ocean she had averaged nearly 200 miles a day, and done it entirely without power.

As *Pamir* passed up the Thames, thousands marveled at her beauty. Scores of old salts looked upon her as a ghost out of the past.

She was almost as great a curiosity to active seamen. In fact, the British broadcast a warning to all watch-keeping officers in steamships to be on the alert for her at night.

I have asked myself whether a nautical writer might take this occasion to draft the obituary of commercial sail. If we inspect the Orient, where thousands of Chinese junks, Makassar praus, and Arabian dhows still work profitably under canvas, the answer is "No."

In Western waters, however, sail's time is up. World War II spelled its death. Bombs, mines, and raiders took their toll.

In 1932 I sailed with one of the 20 square-riggers making the annual grain race from Spencer Gulf, Australia, to the English Channel. Without subsidy of any kind, they competed successfully with steam. It must be admitted that one of these sailers carried an auxiliary engine; but the other ships all scorned her, refused to reckon her in the race.

One by One the Old Ships Go

In 1948 only four genuine Cape Horners survive, and gossip in all the ports that knew them says they will not linger long. One is New Zealand's *Pamir,* the subject of Norman M. MacNeil's splendid series of pictures (pages 703-710). I knew her as a worthy rival to sailing ships in which I served.

Another is the South African *Lawhill,* already an old ship when I sailed in her a quarter-century ago; her days are numbered. Others are the Finnish *Passat* and *Viking.* A few other hulls survive, but no cargo-carrying square-riggers sail around Cape Horn.

It will be a pity when the last one goes. They were all magnificent, in their own way. I learned their strength as well as their beauty, for I gave them half a lifetime.

From the ease of a country home and a garden I now look back to the long, sunny days of sailing through the trades; the quiet, serene beauty of the ships themselves, every sail set in rounded curves of perfect loveliness. The seeming maze of the giant rigging was one of the finest engineering feats ever achieved by ship designers (page 707).

Alone in a world heading into the atomic age, the sailing ship made use of the free winds of God without benefit of artifice; and the satisfactions of those who served her were deep and real. Every voyage was a challenge; its safe achievement a triumph.

Beautiful as these ships were, they bred a tough race of men. Crews, manhandling their ships across the face of the seas, lived close to Nature. They learned to fight not only for every inch the sailer made along the road, but for their own very existence.

Their Blood Was Tar, Hair Rope Yarn

In those days men thought nothing of living in forecastles ankle-deep in sea water. Intense cold cracked their hands and made tough calluses open, running sores.

Nothing could be done about such wounds save to daub them in Stockholm tar. No wonder old-timers boasted that their blood was Stockholm tar, their every hair a rope yarn, their fingers marlinespikes.

In these times the number of men willing to accept sail's hardships is diminishing almost to the vanishing point. Now any deck hand who cares to describe himself as a seaman may tell the cook how he likes his breakfast eggs; he has his choice of two flavors of ice cream; and he can live in a well-furnished two-berth cabin.

Now and then such a man encounters a North Atlantic blow, but not even a deeply laden tanker is such a plaything of the sea as a Cape Horn sailer full of grain.

Some of the square-riggers used to come out of Spencer Gulf and throw their main decks under water as soon as they met the huge rollers of the Southern Ocean. They did not bring their decks above water again until they had rounded the Horn.

Those six to eight weeks were a cold, wet purgatory. Living quarters were constantly wet; clothing could not be dried. There was no heating system; no grog issue. As the galley was frequently under water, food was almost always cold.

And there was no refrigeration. Consequently, salt horse and salt pork, pea soup and stockfish were stand-by fare.

An ever-increasing number of recruits objected to this diet. When other ships began carrying fresh food under refrigeration, it

became difficult to find a man who knew how to make pork fit to stand a year's passage.

Finnish ships, taking a tip from Arabia's sheep-carrying dhows, tended sties of live pigs and slaughtered one a month.

Other vessels gathered the flying fish dropped aboard in the trade winds. In calms, the men caught bonito, dolphins, and albacore. A daily issue of lime juice kept scurvy away.

Winds Scream Through Icy Rigging

Cook and steward excepted, every man had to be on deck in bad weather. At the gale's command, everyone up to the rank of chief mate piled into the high rigging, where the wind screamed and the ice lay incrusted.

By day and by night all hands faced work on the high yards, their only safety a thin wire rope between them and the sea a hundred feet below (page 704). If anyone fell, he was almost surely doomed. Rarely did a lifeboat go out on a rescue mission, for the great sailer, running before sea and wind, could not be stopped. Lifeboat drill was a rarity.

Now and then a ship went missing. Icebergs loomed along the Cape Horn road. A bad landfall, a savage hurricane, a stove-in hatch, a dismasting in a sudden shift of screaming wind—all these things spelled death.

When the sailer goes, she sends out no radio messages, launches no boats; she takes all hands with her.

When I first went to sea, at the end of World War I, I met 70-year-old men in the forecastles of Cape Horn ships. They knew no other life; scorned to go in steam. They ran aloft with the youngest boy; stood up to every violence of the overwhelming sea.

By the mid-1920's these men were gone. In their place came boys. In the full-rigged *Grace Harwar,* a 1,760-tonner noted for her tendency to slay a man a voyage, we had only 13 youthful hands when I sailed with her in 1929. We ran the big *Parma* with a couple of dozen boys.

Rowed 30 Miles to Call on *Pamir*

It was during my days with *Parma* that I learned to know *Pamir.* I boarded her under strange circumstances one evening during the grain race of 1932.

Though I told this adventure in the January, 1933, National Geographic Magazine, it is not unworthy of repetition.

The four-masted *Parma* had wallowed for days in the South Atlantic doldrums when we sighted the lifeless sails of our rival in an equally windless sea 15 miles away.

As there was not much work to be done, a party of us obtained our captain's permission to borrow a lifeboat and pay a friendly call.

It was 2 p. m. as the davits lowered the lifeboat into the sea. At our lower level, *Pamir* sank out of sight below the horizon. After a short row she reappeared.

Taking turns at the oars, we reached her side in the tropic twilight. Our hosts were astonished at seeing us looming suddenly out of the empty Atlantic.

No one in our party had more than a nodding acquaintance with *Pamir's* men; yet within a few minutes we were exchanging yarns like the truest of old friends.

That night we rowed the 15 miles back to *Parma* by moonlight, taking our course from the stars. We reached our own ship at 2 o'clock in the morning, 12 hours after our departure.

Pamir raced us right up to the English Channel. She and *Parma* led the pack in a virtual dead heat. Both made the passage from Australia that year in 103 days.

Finnish Fleet on Last Legs

Some years ago the Åland Islands, a bit of Finland in the Gulf of Bothnia, became the last home of sail. In the port of Mariehamn the redoubtable Capt. Gustaf Erikson based his fleet of square-riggers. Somehow he scraped a living out of bargain-counter charters of Peruvian guano, Chilean nitrates, Scandinavian lumber, and Australian wheat.

Last year Captain Erikson died at the age of 75, leaving the future of his line in doubt. Of all the square-rigged ships he used to own, he bequeathed to his heirs only *Passat, Viking,* and *Pommern*; and if *Pommern* ever carries cargoes again she will have to undergo a costly make-over.

Even in Mariehamn it is difficult these days to recruit crews. War cost the Ålanders seven years of sailing experience. The stream of men going into the grain race dried up.

Early this year Erikson's *Viking* and *Passat* picked up charters of Australian grain, possibly their last cargoes.

Meanwhile, the big *Moshulu* was badly damaged when she dragged ashore in Norway recently. The ex-Scottish *Archibald Russell* is laid up in the River Tyne. *Abraham Rydberg,* once a Swedish training ship, has converted to full power.

Padua and *Kommodore Johnsen,* both Germans, have gone over to the Russians, reputedly as naval training ships.

Parma is broken up.

Denmark's school ship *Kjøbenhavn,* greatest sailer of them all, went missing in the Southern Ocean in 1928-29, leaving no trace.

The cargo-carrying Cape Horner is done

Square-rigger in a Tempest

© Norman M. MacNeil

***Pamir,* Relic of Sail's Days of Glory, Cleaves the Sea in Gale Dress**

ON a January day in 1946 the four-masted bark *Pamir* set out from Vancouver, British Columbia, for her berth in New Zealand. To navigate the Strait of Juan de Fuca, she engaged a seagoing tug, the *Snohomish*. Aboard the latter was the photographer of this series, Norman M. MacNeil.

As the two vessels neared danger-laden Cape Flattery, northwesternmost tip of the United States, a strong gale blew up. To avoid undue strain, *Pamir's* crew set the upper and lower topsails and strongest staysails, only a part of her 40,000 square feet of canvas. Her upper sails remained safely furled. As each sail went up, *Pamir's* speed increased until at noon her crew let loose the towline and the great ship was free and on her own.

"Then," writes Mr. MacNeil, "we witnessed a drama reminiscent of that age long past when the clippers reigned supreme. As we stood spellbound, *Pamir* came racing toward us. Huge seas boiled over her bow. Her sails, billowed out to the full, were a scene of grandeur.

"Though seasick, I wrapped a towel around my camera for protection against rain, balanced myself on the heaving deck, and photographed the *Pamir*. Heeled well over in the terrific wind, she swept by majestically at a good 14 knots. *Snohomish's* flags ran up, spelling 'Bon voyage,' and her whistle hooted farewell to one of the last great wind ships. Soon she disappeared hull down on the horizon."

Resembling ink spots, a flock of "Irish pilots" (gulls) pursues the bark for "gubbins" (scraps) thrown over by the "doctor" (ship's cook).

Norman M. MacNeil

In Harbor, Slack-wire Dancers Nonchalantly Loose Canvas on the Fore Upper Topsail Yard

Only the footrope, a steel cable, lies between safety and death. Stomachs pressed against the yard, the men work with hands free. They maintain balance on an icy footrope even as the ship rolls in a gale. Blue peter, the flag on the foreroyal yard, calls shore parties to duty, as the ship is about to sail.

Barefoot Helmsman Holds the Course

In bad weather the wheel is more than he can handle; sometimes four men are needed. *Pamir's* wheel stands on the midship superstructure. Immediately abaft is the charthouse, where the bark's navigating is done.

The ship's bell, seen behind the wheel, strikes the hours and half hours, eight bells signifying the end of a watch. These "bells" date from the days when ships used sandglasses to measure half hours. Upon each turn of the glass, a bell was sounded.

Norman M. MacNeil

"Hamburg 1905" Bespeaks *Pamir's* Origin

Blohm & Voss yards, frequent target of Allied bombers in World War II, built the bark.

Beside her name plate stands the third mate. Far removed from the old-time "bucko" mate who manhandled shanghaied crews, he has to nurse inexperienced boys. He finds few men left who understand the old-time words of command.

Once *Pamir* carried Chilean nitrates for Germany. Later she joined the Finnish sailing fleet. By seizure in World War II she became a prize of New Zealand.

Pamir has had an adventurous career. Her masts have towered off most of the world's coasts. Her registered tonnage is 2,800 tons; her steel hull is 316 feet long. Top speed is 16 knots. Her New Zealand crew numbered 45; the Finns sailed her with fewer than 30.

Norman M. MacNeil

Norman M. MacNeil

Cordage Shrieking, Masts Swaying, the Bark Scuds Along. "Earth Will Not See Such Ships Again" (John Masefield)

Laden with 3,500 tons of wheat, *Pamir* rides deep in the angry sea. Taut in the wind are the six square topsails, jigger staysail, the fore, main, and mizzen-topmast staysails, and the inner jib. This is all the canvas the bark dares show to the gale. Her jigger mast is stripped lest sail there cause her head to drive up into the wind.

A Bewildering Maze of Lines Is Shipshape

Working in the dark, a square-rigger seaman can place his hand on every stay, line, tackle, sheet, shroud, and halyard shown here. Most of the running rigging is employed in handling sails. Heavy shrouds carry the ratlines and support masts (page 708). A flying bridge leads to the midship house. Below it, the winch is used for bracing the yards. The "fireplug" on the main deck is a capstan.

In 1932 *Pamir* raced 19 other square-rigged ships from South Australia to the English Channel. All carried grain, a cargo they snatched from steam competitors because they could load in primitive ports.

Pamir and her principal rival, *Parma,* set out for Cape Horn on the same day. Storms and doldrums beset them.

Leading all the others into port, *Pamir* and *Parma* docked in 103 days, still virtually neck and neck. Of the 18 other contestants, two did not survive to sail again. For an account of their thrilling 16,000-mile voyage, see "The Cape Horn Grain-Ship Race," by A. J. Villiers, in the January, 1933, NATIONAL GEOGRAPHIC MAGAZINE.

The last Australia-England grain race was in 1939. *Pamir* placed third.

Norman M. MacNeil

Norman M. MacNeil

No Place for Weak Heart or Faltering Legs—a View of the Main Rigging from Below

Held by four shrouds, the lower ratlines are broad enough to accommodate six men abreast. Nearly all the rigging is wire; yards and masts are steel. *Pamir's* mainmast, composed of several sections, towers 175 feet.

In the Officers' Mess . . .

. . . and on the Forecastle

The swinging lamp (left) remains upright no matter at what angle the ship may roll. At the break of the forecastle head, the bell is used to report what the lookout sees—one bell, a ship on the starboard bow; two bells, one on the port; three bells, one right ahead. The old-style anchor, a spare, rests in a housing in the deck.

Norman M. MacNeil

Capt. Desmond Champion (Right) Entertains Old Cronies in His Cabin

On his return to Vancouver the skipper relates how two men were washed overboard but were saved during the Cape Flattery storm. On the wall he displays the photographer's gift picture of *Pamir* (page 703).

Norman M. MacNeil

Her Furled Sails Resemble Snow on the Mountains as *Pamir* Proceeds under Tow

Unable to match the economy of steamships, the windjammers are all but a memory. An ocean grave took many; others went to the breakup yards. Their romance and glamour are preserved on artists' canvases and in model builders' glass bottles. *Pamir* has no auxiliary engines.

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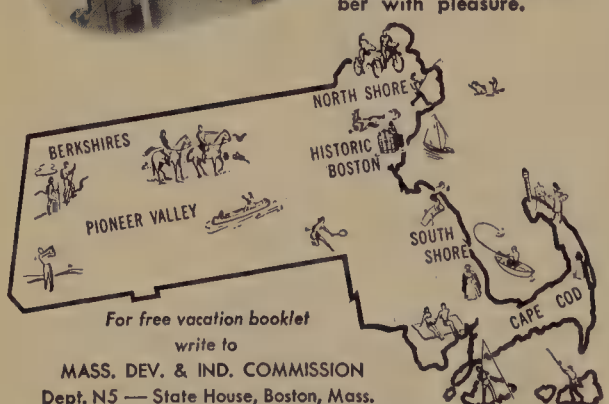

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ossom Celebrations:
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JUNE

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Nat. Open Golf, Pacific Palisades, Cal., June 10
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Buccaneer Days, Corpus Christi, Tex. . . June 12
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Philadelphia . . . . . June 12
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Season Begins, Isle Royale
National Park, Mich. . . . . June 18
Season Begins, Yellowstone Nat'l. Park, June 20

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Country Dance Festival,
Amherst, Mass. . . . . July 20
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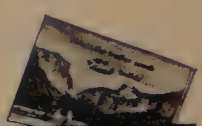

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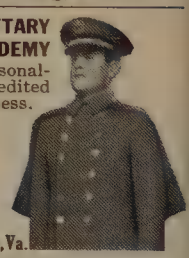

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5-48

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VOLUME XCIII NUMBER SIX

THE NATIONAL GEOGRAPHIC MAGAZINE

JUNE, 1948

Map of the North Central United States

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To carry out the purposes for which it was founded sixty years ago, the National Geographic Society publishes this Magazine monthly. All receipts are invested in The Magazine itself or expended directly to promote geographic knowledge.

Articles and photographs are desired. For material The Magazine uses, generous remuneration is made.

In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

The Society's notable expeditions have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic. By dating the ruins of the vast communal dwellings in that region, The Society's researches solved secrets that had puzzled historians for three hundred years.

In Mexico, The Society and the Smithsonian Institution, January 16, 1939, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 B. C. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

On November 11, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to the world altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, and obtained results of extraordinary value.

The National Geographic Society-U. S. Army Air Forces Expedition, from a camp in southern Brazil, photographed and observed the solar eclipse of 1947. This was the seventh expedition of The Society to observe a total eclipse of the sun.

The Society cooperated with Dr. William Beebe in deep-sea explorations off Bermuda, during which a world record depth of 3,028 feet was attained.

The Society granted $25,000, and in addition $75,000 was given by individual members, to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California were thereby saved for the American people.

One of the world's largest icefields and glacial systems outside the polar regions was discovered in Alaska and Yukon by Bradford Washburn while exploring for The Society and the Harvard Institute of Exploration, 1938.

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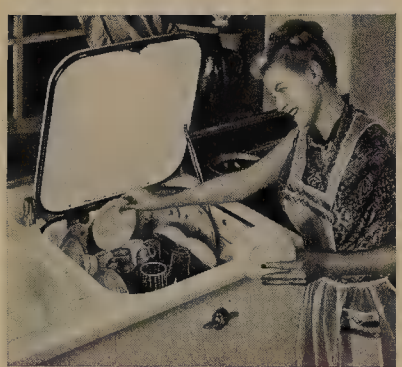

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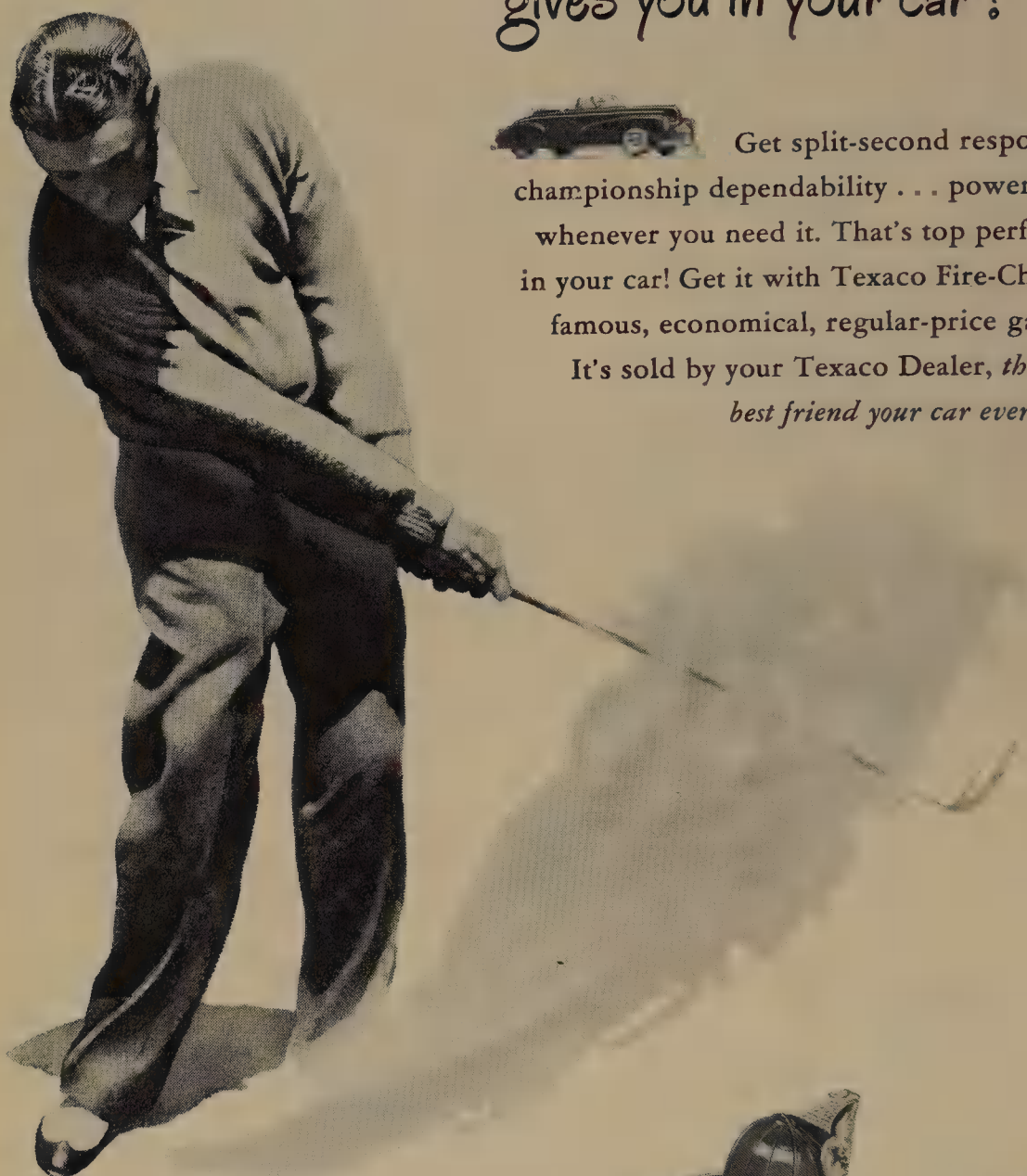

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These rugged railroad couplers, whose "universal grip" often holds together more than 5,000 tons of loaded freight cars, are the product of never-ending research and tests. Begun sixty years ago by the Master Car Builders, this work is now carried on by the railroads through the Association of American Railroads, the mutual agency for the betterment of *all* railroading.

This is just one example of how railroads, which compete with one another for business, also work together to improve such standardized and interchangeable parts as wheels, axles, trucks, brakes, draft gear, and safety devices. Such cooperation between railroads helps provide America with the most economical, the most efficient, and the safest mass transportation system in the world.

ASSOCIATION OF AMERICAN RAILROADS

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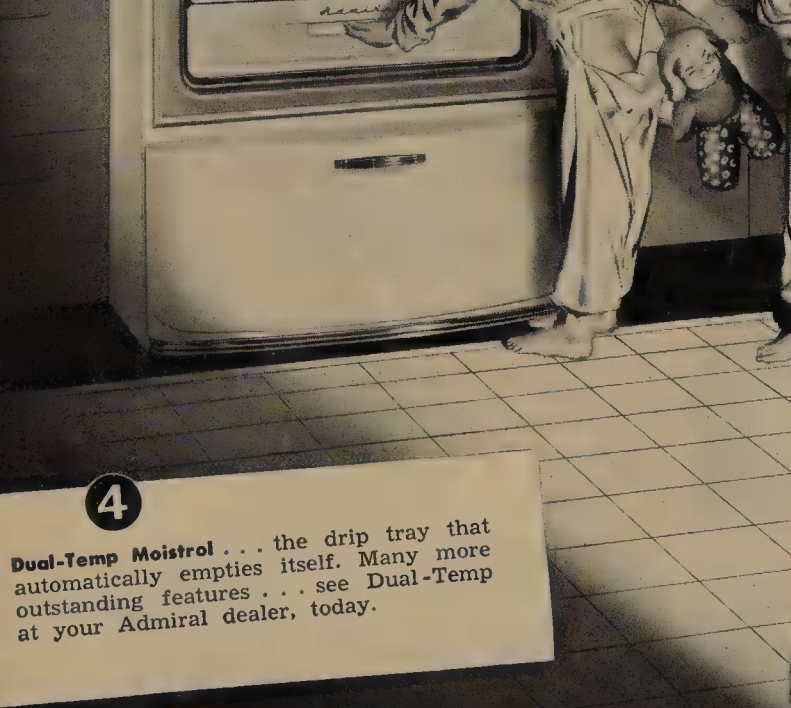

4 **Dual-Temp Moistrol** . . . the drip tray that automatically empties itself. Many more outstanding features . . . see Dual-Temp at your Admiral dealer, today.

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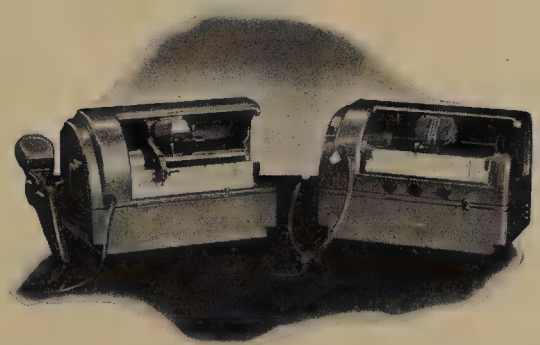

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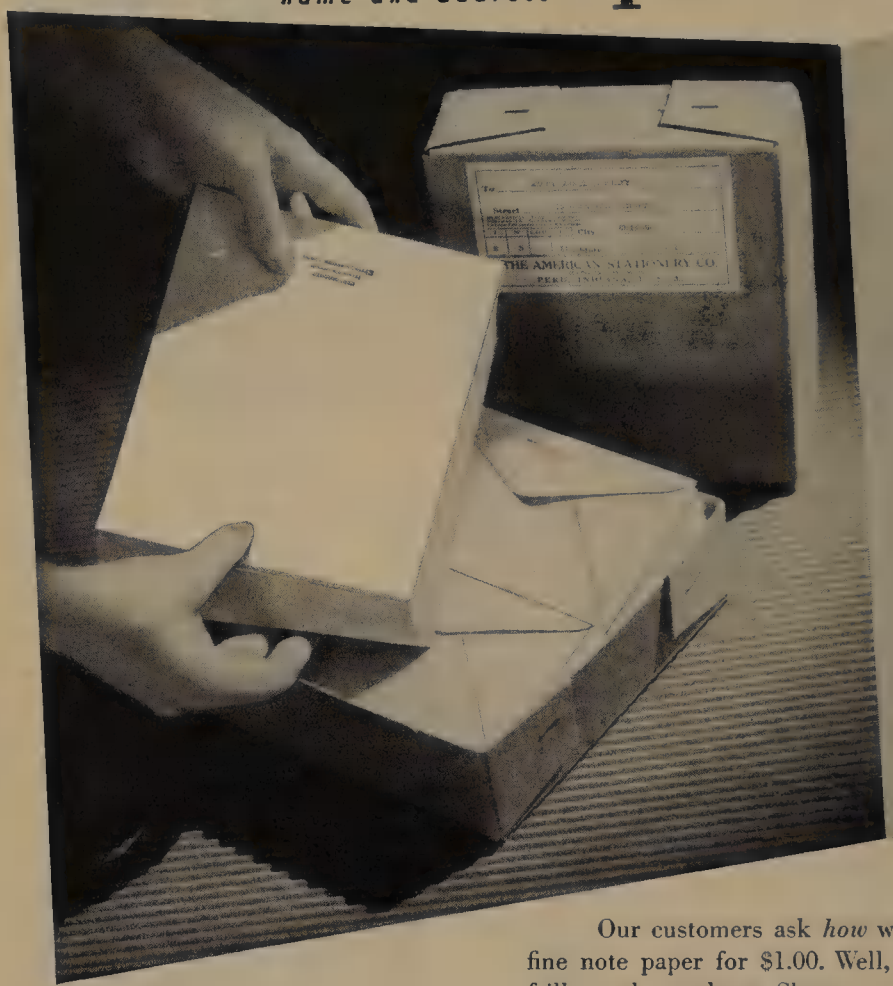

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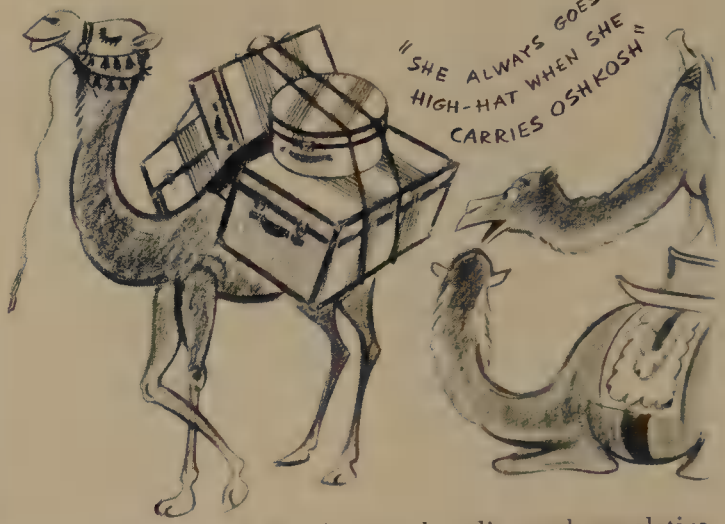

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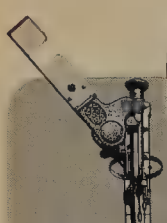

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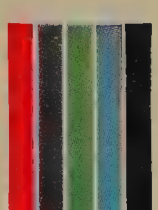

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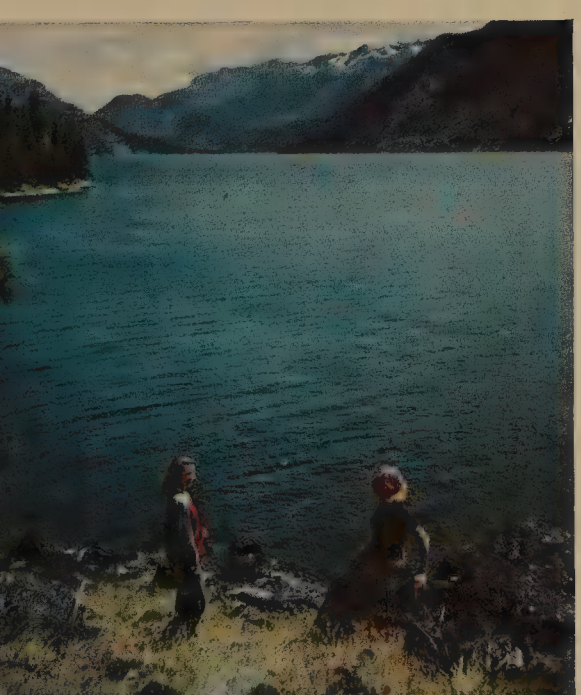

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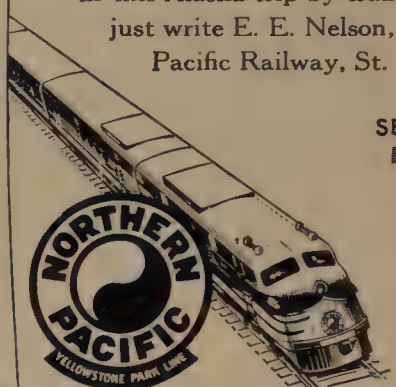

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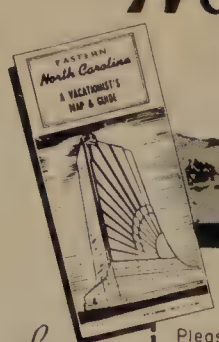

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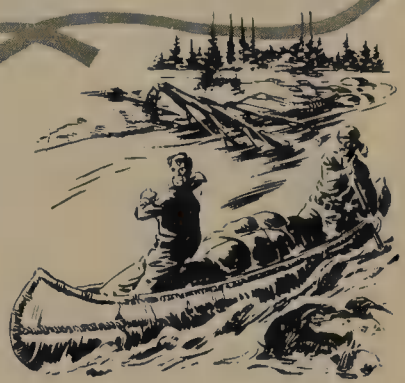

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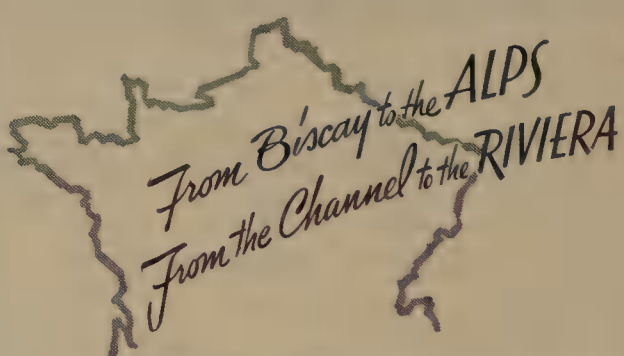

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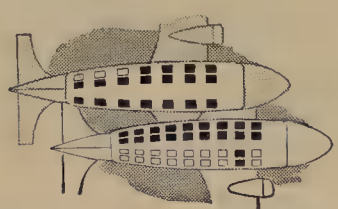

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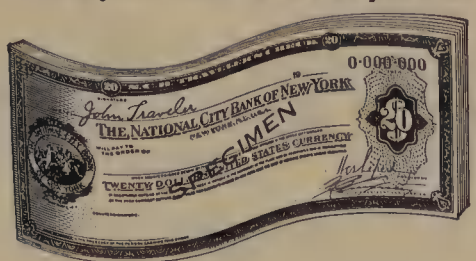

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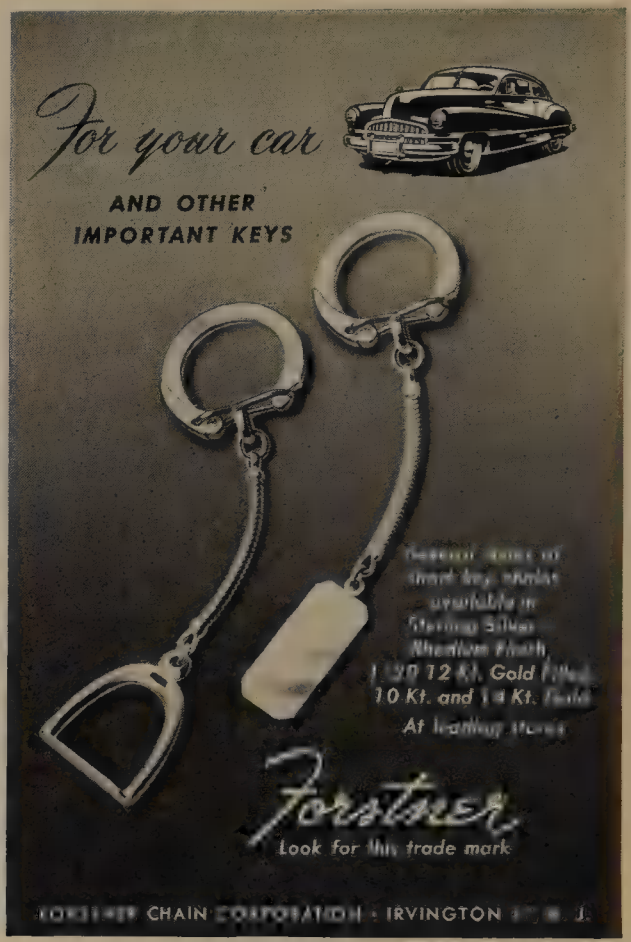

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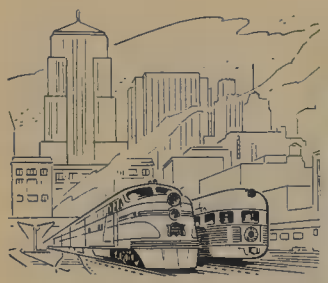

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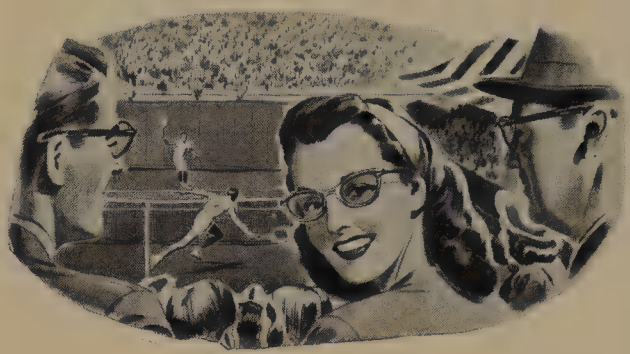

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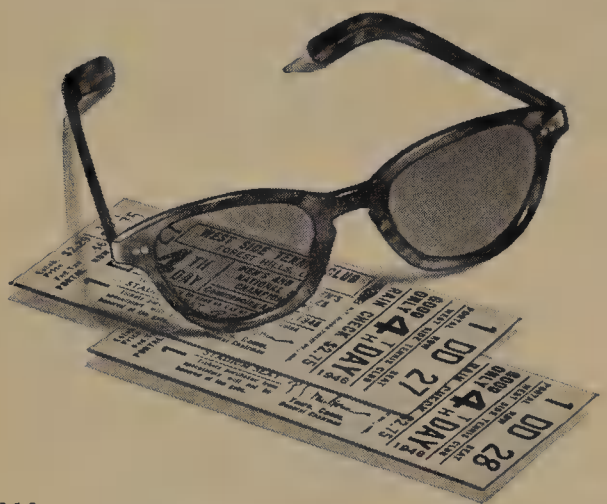

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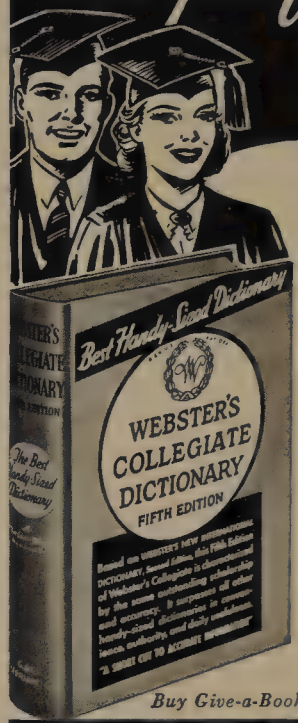

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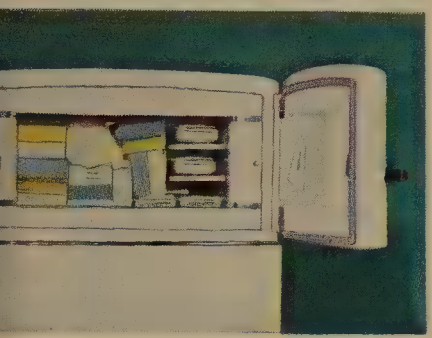

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RO STORAGE: Gives you 1.5 cubic t for quick-freezing foods and ice es, and for dependable, long-time rage of as much as 53 pounds of zen foods. Maintains zero tempera- e at all times.

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following "timetable" shows prac- al storage periods for maintaining h quality of all frozen vegetables, its, and meats:

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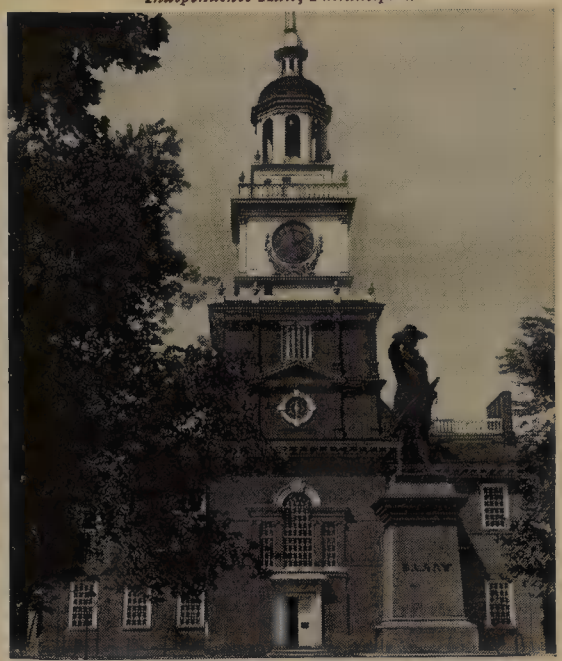

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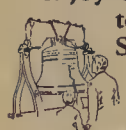

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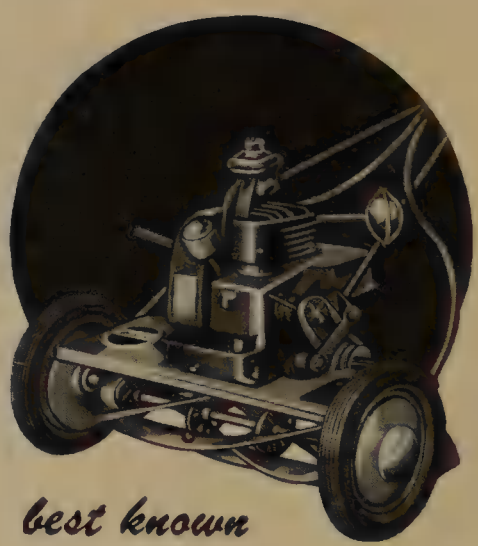

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EVEN MR. LONGFELLOW couldn't do justice to the murmuring pines and hemlocks in this Evangeline country. And, of course, he missed that wonderful Canadian Pacific hotel, Digby Pines! It's in Nova Scotia... right in the heart of a playground paradise on the sea.

LAKESIDE INN is another Canadian Pacific resort in Nova Scotia. And over in New Brunswick at St. Andrews-by-the-Sea is The Algonquin! That means, besides the sports and good food... you can expect warm hospitality and special service.

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Polident comes in two sizes—regular and large economy size—available at all drug-stores. It costs only about a cent a day to use, so get a can of Polident tomorrow, sure.

*"I know I'm free from Denture Breath these days, thanks to Polident. And my mouth *feels* so much better now that my plate is really clean!"

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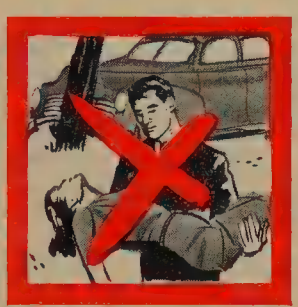
RECOMMENDED BY MORE DENTISTS THAN ANY OTHER DENTURE CLEANSER

What can you do till the **DOCTOR** *comes?*

Q. Do you know what to do if there's an accident?

A. If you know and can use First Aid after an accident, you may prevent a lasting injury, even save a life. Accidents will injure 9 million Americans this year. One may happen where you are, and it's up to you to know what to do—*and what not to do* until competent medical help arrives. To learn the new, approved First Aid methods, register for the classes held by your local chapter of the Red Cross.

Q. Do you know what not to do?



A. Don't try to *be* the doctor! Do whatever is necessary to save the victim's life, and to prevent shock by keeping him warm and quiet, *but no more.* Don't move the patient unless it is absolutely necessary. Don't give unconscious persons water or liquids. Remember, doing the wrong thing may be worse than doing nothing, and a good rule to follow is "If in doubt—DON'T."

Q. Have you a First Aid Book in your home?

A. About one half of all accidents occur in the home, and a first aid book should be a "must" in your medicine cabinet. If you don't have one, *send for Metropolitan's booklet, "First Aid."* It gives the proper immediate treatment for bleeding, stoppage of breathing, poisoning, burns, broken bones, and many other emergencies. To get your free copy, simply fill in and mail the coupon below.

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VOL. XCIII, No. 6 WASHINGTON JUNE, 1948

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Midshipmen's Cruise

BY MIDSHIPMEN WILLIAM J. ASTON AND ALEXANDER G. B. GROSVENOR, USN

"SHOVE OFF, coxswain. Return to the sea wall," sang out the Junior Officer of the Deck of the U.S.S. *New Jersey*. About him was the clamor and confusion of the launch's load of midshipmen trying to locate sea bags, suitcases, and blue service uniforms heaped in pyramids on the forecastle.

The motor launch, empty now of its cargo of human freight, with a roar headed back to the United States Naval Academy dock in Annapolis, Maryland.

Wistful glances followed her wake as she gradually grew dim in the rainy mist of that early Saturday morning, June 7, 1947. Some fellows, perhaps a little homesick, tried to bring to life the last beautiful image of the June Week O.A.O. (one and only). But the eager ones were already heaving sea bags down the forehatch, glad to be away from the confining walls and books of the Academy and bound for foreign shores.

Ever since Rear Admiral James L. Holloway, Jr., Superintendent of the Academy, had announced our cruise plans, all hands had been enthusiastically awaiting this day.

Edinburgh, Oslo, Copenhagen, London—glittering names lay ahead. Now with our task force of two battleships, *New Jersey* and *Wisconsin,* the carriers *Randolph* (flagship) and *Kearsarge,* the LSD *Fort Mandan,* and four destroyers, 2,100 midshipmen shoved off for their first taste of a sailor's life and travels (Plate I).

The new second class (juniors) enjoyed the sunbathing on the flattops (Plate XV).

Our division of 60 youngsters (third classmen, or sophomores) and first classmen (seniors), plus 10 Reserve midshipmen from various colleges, was quartered forward of *New Jersey's* No. 1 16-inch gun turret. Our pipe bunks—and they were comfortable too—were stacked in tiers of four, lining the bulkheads (walls or ship's side) and grouped compactly in columns, fore and aft, two tiers wide, but with enough room to scoot out quickly.

We were each assigned a locker, so tiny it left us skeptical. How could we cram all the gear in our two bulging bags into that small space? Nevertheless, after much refolding and rolling, our "white works," "skivvies," etc., were squeezed in.

One of Uncle Sam's battlewagons is a self-contained, multi-decked machine. Think of it as being divided into thirds. The superstructure, with its bridge and command stations, is the brain. The middle third (first two decks below main deck) feeds and repairs the two other sections. Lastly, the lower division, with its turbines, boilers, and generators, energizes the ship.

We Learn Our Way Fore and Aft

It was three or four days before we could step through watertight doors from one compartment to another without bruising our shins. But it took longer to master climbing and descending ladders (no stairs!) from one deck to another without use of seat, elbows, and gravity.

Shipboard navigation, taught by personal experience, was not learned by many for weeks. We were in England before some of us found the cobbler or tailor shops. During a pre-cruise lecture a humorous instructor said that to survive the cruise we must learn the location of only three places: our bunks, the chow line, and the "head." We all survived.

A frequent question of the late war was, "How can Halsey and Mitscher stay at sea so long without refueling at a base?" Now it is an everyday trick to transfer millions of gallons of fuel from a fleet oiler to thirsty battlewagons while under way. Our first dem-

U. S. Navy, Official

Midshipmen Leave H.M.S. *Victory's* Entry Port and Walk down the Brow (Never Gangplank!)

A latticelike series of gangway steps, or battens, enabled men to climb aboard. Muzzle-loaders peep from three gun decks. Each of the three masts has a fighting top (upper right) where some ships stationed marines to fire muskets during battle. A ball from such a French top killed Lord Nelson at Trafalgar (page 719 and Plate XXIX).

onstration occurred a day out of Annapolis.

Sunday morning, on coming topside for our first look at the Atlantic, we were greeted by a startling sight. Dead ahead steamed a Navy oiler, the huge *Wisconsin* surging close to her portside. At first glance they seemed about to collide, but then we saw they were laced together with snaky black lines (Plate X).

Slowly our skipper conned the *New Jersey* into position on the opposite side. Inch by inch we crept up, until we were only 100 feet from the oiler's bridge. Because of the armored conning tower, steersmen on duty could see only dead ahead, so they never knew how close the steel monsters were. Eyes glued to compasses and ears tuned to captains' voices, they kept the ships on steady course hour after hour. A veteran officer told us that even in wartime simultaneous refueling of two battleships was as rare as "sun off Cape Horn."

Our big ship supplied its destroyer escorts with fuel throughout the cruise. What a sight it was to see a "can" bucking the waves as she received her oil transfer!

These sleek ships swung up from astern, turned parallel to us, and slid over to within 20 feet of our life lines. Then, as they stuck their sharp noses into every wave, we fired lines from our heaving guns over their forecastles.

Quickly the crews pulled over hoses, and the cans were suckling alongside the mother ship. Waves breaking over the destroyers made it a risky and slippery job for the line-handling crews (Plate VIII).

Less Romance, More Work

Some landlubbers imagine that midshipmen's cruises are luxury voyages. Admittedly, foreign ports are romantic; but long days of work at sea are far from luxurious.

On last summer's cruise the youngsters received instruction from three academic departments—Seamanship and Navigation, Ordnance and Gunnery, and Marine Engineering—for a month each (Plate IX).

Our "seamo" course qualified us for the rating of seaman, first class. We lived the lives of deckhands, did their jobs, stood their watches. Thus we began learning the Navy from the bottom up.

Our watches, stood four hours on and twelve off (instruction periods were attended when off duty), ranged through 32 different stations, from a lookout in the clover leaf (the tiptop level of the mast) to a life buoy watch at the rail or assistant helmsman on the bridge. Many of us found our spell at the wheel the most thrilling job. It was quite a trick trying to hold that monster within a degree of her course.

We all favored Ordnance and Gunnery. Besides being out in the air most of the time, we stood no watches.

During the day's three hourly drills we became familiar with the ship's guns, perhaps by a tour through a monstrous 16-inch gun turret or by actually tearing down and cleaning a 40-mm. antiaircraft gun. Often we viewed training films and studied for and passed the tests seamen must take to become third-class gunner's mates.

In Marine Engineering we experienced our most uncomfortable conditions. This was particularly true for those lads down below when tropical climate prevailed.

To familiarize midshipmen with the "works" that make a mighty battleship tick, we stood watches at nearly every engineering station, from tending a blazing boiler to jockeying a turbine throttle in an engine room. We weren't long discovering how to brew the black gang's favorite drink, "Joe" (coffee). We gulped it beneath a roaring air blower and soon kept pace with the crew, sometimes drinking 10 cups a watch.

Reveille! Grab a Brush!

"Reveille! Reveille! Heave out and trice up." Dim ruby battle lamps blink off, and blinding overhead lights flash on.

You glance at your watch—5:30. It's too early; oh, for a few more minutes' sleep! You roll over, hoping . . .

"Hey, mister! Hit the deck! Make up that bunk and clear the compartment."

You stumble around trying to sort out your dungarees from piles of your shipmates'.

Ten minutes after reveille the Navy is after you again.

"Turn to! Scrub down all weather decks! Clamp down all living spaces!"

You stagger up through the hatch and greet the morning. Your fervent hope of meeting a torrent of rain (your only escape from scrubbing) is shattered by the glaring sun.

Finally you reach your division's cleaning area. Any fellow earlier than you already has the deck awash. Last thoughts of sleep die out when the hose tender arches a chilly stream of water over your shivering bare feet.

A bosun's mate bawls for action. "O.K.! O.K.! Grab a brush and get moving."

A few of you jam sticks (the standard Navy handles) into scrub brushes and, with a hose backing you up, you soon have the area covered. Others follow the brushes, clearing off the water with rubber squeegees. If any salt streaks appear on deck, the job has to be done over again (Plate VI).

Just before the first call to breakfast, the bosun's mate grumbles, "O.K., secure! Every-

body on deck sooner tomorrow morning."

Breakfast!

Long before the bosun's shrill call to the first mess, two chow lines begin to form on either side of the ship. Soon they lead all the way to the stern and double back, so the hindmost man actually heads away from his meal.

Folding benches and portable tables fill the eight mess compartments, which between meals double as classrooms, theaters, and places of worship (page 718).

To feed the crew expeditiously, serving is done cafeteria style.

If you're in a hurry, you may stow your chow in five minutes; lingering is not encouraged. The entire crew must be fed in three chow calls, each 15 minutes in length.

For heavy eaters, survival depends on the number of times they contrive to go through the line. A tasty dessert always means a lasting line.

Seagoing Housemaids Have a Field Day

Field day, to one who doesn't know the secret, sounds like a day of merrymaking or suggests a track event.

But field day in the Navy serves the ship as a housewife's weekly cleaning day. Every bulkhead is scrubbed, paintwork washed, all brightwork polished (Plate VII). Last, but not least, the teak decks are holystoned.

This nautical word may be familiar, but have you ever seen a holystone in action? From painful memory, every admiral can give a vivid description of the tool.

Wooden decks once were holystoned every day, but heavy wear by sand and stone meant expensive replacements. Therefore, today's seamen turn to with their "boiler bricks" and bent backs but once a week.

To holystone, one needs equipment valued at less than a quarter and a 30-second lecture, including instruction in elementary wrestling. The instruments of torture are a long stick, sand, water, and a halved fire brick. The stick fits a small hole in the brick.

Do you want to learn the proper grip and stance? O.K., bend over double and take hold of a broom with your left hand about 18 inches from the bottom. Then place the upper half of the handle against your right hip. With your right hand, reach under the stick and grab your left wrist. This hold, a perfect double arm lock, enables you to push down on the stone and at the same time slide it back and forth sideways.

Five to 30 midshipmen line up along a plank (page 716). With one to count cadence, the entire group should move in rhythm. But there's always some knucklehead who delights in doing things the opposite way. The stroke is about 20 inches, right, left, right, left, until 20 passes are made. Then with the command, "Shift," the men step back or forward together to the adjacent plank.

This work is as backbreaking as any ever devised, and there is no way to beat the system. Should a fellow slack up, the stick slips and trips the brick, snarling the rhythm.

Field day for those down in the engine spaces is certainly the most unfavorable aboard ship. Its dirtiest form is boiler-tube cleaning. Stripped to their waists and armed with wire brushes, the black gang worms through a small hatch into a jet-black boiler. Here, with an extension cord and bulb for illumination, the lads scrape the carbon-caked water tubes. Often a chisel is needed to loosen the scale. The work isn't as backbreaking as holystoning, but it is certainly the dirtiest aboard ship.

Or you might find yourself confined down in the bilge, or double bottom, scraping rust and cracked paint and then repainting. A mixture of slime and yellow chrome forms a colorful but greasy coating on blue dungarees.

Now you can understand the luxury of drawing a morning or afternoon watch on field day.

We Drill with Dummy Guns

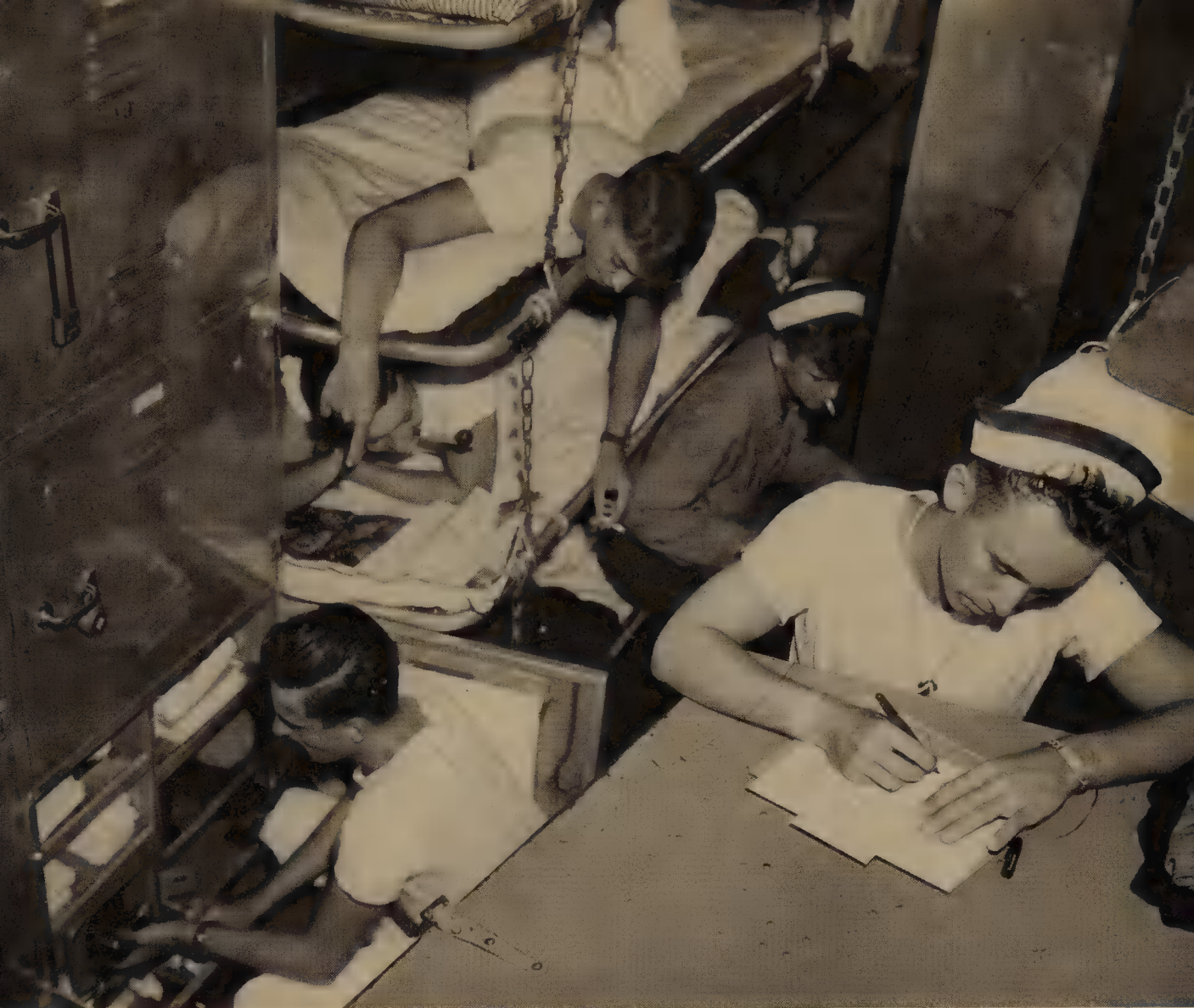
After two weeks at sea we took over the defense of the ship. With the exception of officer safety observers, the 40-mm. antiaircraft guns and dual-purpose (air and surface firing) 5-inch batteries were manned by youngsters and first classmen. So were the nine 16-inch guns in the three turrets.

Daily drills soon made us as proficient as the ship's company crew. At the first note of General Quarters, we double-timed to our mounts and turrets. Unless actual firing was scheduled, we practiced training the guns and simulated loading and firing them.

But you don't learn to load these weapons by tossing live ammunition around—you might burn your fingers! So for the first two weeks we viewed Navy training films and practiced on loading machines (Plate XI).

These dummy gun mounts produced only loud and annoying bangs. Tangible products were bruised toes and sprained fingers. Using dummy powder bags and counterfeit shells, the 5-inch loading machine operated with seemingly perpetual motion, its "firing" halted only by an officer whose stop watch was our whip (Plate XIII). Two men heaved a powder bag and shell into the breech; another "fired" them forward into the hands of two others. The operation grew monotonous, but efficient.

Our targets usually were red sleeves about



Alexander G. B. Grosvenor

***New Jersey's* Cruising Youngsters Bunk Sardine-fashion in Tiers of Four**

Each man has a locker so small that he wonders how he can cram all his gear into it (page 711). One lad uses a peacoat locker top, his compartment's popular card table, as a writing desk.

30 feet long, towed by carrier planes. As a special treat, tiny drones were launched from catapults aft (Plate XIV). These radio-controlled planes, guided by an aviator on *New Jersey's* fantail, made *kamikaze*-like passes over the ship from every angle. Pursuing erratic courses, they were harder to knock down than the sleeves.

"Hummingbirds" Deliver the News

"In the old days, when I was at sea . . ." Who hasn't heard these words from some salt-crusted seaman of yesteryear? Imagine what he'd say if he saw a helicopter delivering the morning newspaper!

Each day around 0630 (6:30 a. m.) one of these mechanical hummingbirds, operating from the *Randolph,* made the rounds of every ship, delivering packets of guard mail and the *Cruise News,* the squadron's daily newspaper.

Transfer of mail took only about 30 seconds. On approaching the ship, the co-pilot lowered a satchel by hand. Petty officers on *New Jersey's* forecastle detached it and hooked on their own outgoing mail.

Occasionally, too, a hitchhiking officer was dropped off or picked up (Plate VIII). While the 'copter hovered above the deck, a steel line was lowered by winch mounted on the helicopter's roof and hooked to a linen strap under the arms of the passenger. Then the pilot hoisted him until he could swing into the cockpit.

Our first landfall in the British Isles was Butt of Lewis, northernmost point of Lewis, largest island of the Hebrides. In a few hours the sheer cliffs of Cape Wrath drew abreast as we continued eastward to Dunnet Head, sentinel of the western approach to Pentland Firth.

It was a beautiful Sunday morning when we entered this 7-mile gap between the Orkneys and the mainland. The waters just inside the Firth were so placid it was difficult to believe the warning of the *British Islands Pilot,* which cautions vessels, in fair weather or foul, to expect extremely turbulent waters.

Stephen Paul

Arms Locked Around Sticks, Youngsters Holystone *Wisconsin's* Deck. Once in Line, No One Can Shirk This Backbreaking Job

Middies Monopolize Elizabeth and Her Fiancé

Last summer twenty lucky midshipmen were invited to the Buckingham Palace garden party honoring Princess Elizabeth and Lt. Philip Mountbatten.

Here three Americans (center, right) have gained the Princess's side. Mountbatten (in Royal Navy uniform) stands at her right.

"Their naturalness and friendly nature quickly put us at ease," one of the midshipmen said. "Soon we were chatting gaily and even joking. . . . Our talk, which lasted 10 or 12 minutes, was finally interrupted by the fidgeting ushers, who realized we had more than tripled the usual allotment of time."

Later the Americans proceeded to rescue Princess Margaret Rose from her seeming boredom. Said one: "I was tempted to ask for a date, but courage failed me."

For once, the King is not the main center of attention. He stands at left center talking with civilians (page 720).

Stephen **Paul**

Alexander G. B. Grosvenor

Chow Time Knows No Slackers; Every Man Aboard Ship Does His Duty Nobly

Performance is especially noteworthy whenever the Navy serves a tasty dessert; then some men go through the cafeteria line twice (page 714). Even in hot weather, many of these lads drink a dozen cups of coffee a day.

The most treacherous spot is a narrow, ever-shifting belt where the 7-knot current from the North Sea clashes with tides moving in from the Atlantic. The rocky coasts of northern Scotland and the Orkneys act as a funnel, causing the waters to converge in the Firth.

This belt of water is marked with violent eddies and treacherous whirlpools. Even with such splendid weather as we enjoyed, our 45,000-ton ship was twisted like a small steamer. Steering was difficult; standing required a balancing act.

Next morning we entered the Firth of Forth, the main estuary on the east coast of Scotland. Sir Walter Scott and Robert Louis Stevenson sang the praises of the view from the Highlands, where the Forth lies spread out "like a blue floor," bordered by golden sands and green fields.

Task Force 81 entered the Firth on a gray, rainy day. We saw, not the golden sands or blue floor, but only a cold gray blanket, spotted here and there by brownish hamlets and dark, sleeping ships. Ahead arched the Forth's famed cantilever bridge (Plate XVII).

As we sailed below, our mast almost brushing the span, five hooky-playing Scottish children leaned out and waved a large American flag. So slight was our clearance that they could almost have stepped down into our lookout tower.

Those smiling youngsters typified the Scotland we saw during our visit. Scotland to us was a land of rugged scenery and never-shining sun. Its fiercely proud, liberty-loving people made us feel at home in this, our first port of call (Plates XVIII to XXV).*

Oslo Welcomes the Middies

Just before breakfast on June 30, two days out of Rosyth, our two battleships swung north into Oslofjord, leaving the Skagerrak astern. The other ships of our squadron had

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Bonnie Scotland, Postwar Style," by Isobel Wylie Hutchison, May, 1946.

left for ports in Denmark and Sweden.

Some 20 miles up this deep, forest-banked fjord, we exchanged salutes with Karljohansvern, headquarters of the Norwegian Navy.

Scores of graceful sailboats, heeling gently to the morning breeze, joined in welcoming us to Oslo. Friendly cheers were frequently exchanged, particularly when a boat's crew was feminine.

Our 5-day visit to the Norwegian capital was high-lighted by shopping sprees, social functions, and country tours. Bartering with the store clerks wasn't difficult, as English was fairly well known. Most of us sought brilliantly decorated ski sweaters and Norse winter outfits. It seemed strange to see skis being brought on board in the evening by perspiring new owners.

Some of us took an electric train up to Frognerseteren, on a hill northwest of Oslo, which is a center of Norway's famous winter sports.

Looking down some 1,500 feet, we beheld a panorama of rare beauty. Our view stretched 50 to 70 miles about the compass. To the east the pine-covered hills of the Swedish frontier dotted the horizon. To the south lay Oslo, its fjord winding away into the distant mist. Our anchored battleships seemed tiny and insignificant.

Viking Ships Re-create the Past

Oslo gave a round of dances and parties in our honor. At the American Embassy's dance, two Navy orchestras from the squadron played our favorite numbers. Norwegian girls, beautiful as they were gracious, danced with us to the strains of American music.

Oslo's hospitality seemed to have no limit. There were few middies who didn't enjoy a home-cooked meal. One mother insisted that a midshipman date her son's fiancée while the poor lad remained home!

To many, Oslo's museum of Viking ships was the most interesting sight in Norway. Found entombed in blue clay near Oslofjord, these relics offer standing proof of Norway's early maritime prowess.

When Viking chieftains died, they were often buried in their ships, along with their possessions. The Oseberg ship contained such an abundance of articles that it gave a reliable picture of the daily life of the Vikings around A. D. 800.

A more advanced link in the country's nautical history we found at the Fram House. The *Fram,* built in 1891-92, was specially designed for polar exploration and built by Colin Archer, of Larvik. At points her sloping sides are almost a yard thick. Her hull is rounded so as to rise out of the ice if squeezed by the pack. When the *Fram* was frozen in on Dr. Fridtjof Nansen's polar expedition (1893-96), its scientific design and structural strength enabled it to overcome ice pressure that would have crushed conventional ships.

A visit to the Royal Yacht Club on the Frognerkilen would excite any sailor with admiration for the seafaring Norwegians. Here we found a fleet of 6-meter and 20-square-meter boats. The navigators of the clumsy Viking longboats would have gaped in awe could they have seen these slim, graceful sailboats skimming along in the class races.

Our Norwegian visit ended with a dance on the *Wisconsin.* "Wisky's" decks, surrounded by decorated life lines, presented an unusual dance floor. Lights and signal flags gave color to the scene. A lavish spread in the officers' wardroom satisfied the hungriest "chow hounds."

Leaving Norway, we witnessed a magnificent demonstration of seamanship. Crown Prince Olav reviewed our battleship division as we steamed for Portsmouth, England. Rather than use a destroyer or a large yacht, he stood in the cockpit of a 50-foot cruiser tossing and yawing in the choppy mouth of Oslofjord.

Throughout the passing of our ships, the Prince adhered to the adage of the sea, "One hand for the ship and one for yourself." Never before had we seen a boat do four-dimensional gymnastics. Yet at all times the Prince had his right hand raised smartly in salute as *Wisconsin* fired the 21 guns reserved for chiefs of state and for royalty.

Nelson's *Victory* Almost 200 Years Old

During our stay in Portsmouth, most midshipmen visited H.M.S. *Victory,* Nelson's flagship at Trafalgar. At the time of her launching in 1765, this 2,162-ton man-o'-war was the fastest first-rate of her size in the Navy. Others had gun decks 175 feet in length, but *Victory's* was 186 feet. The added length gave her finer lines and extra speed.

Midshipmen were given the run of the ship. Those who desired could join tours conducted by British petty officers.

Interesting yarns could be coaxed from the guides. We were told, for example, that strict naval etiquette was enforced aboard a flagship even in Nelson's time. An admiral always walked on the starboard side of the quarterdeck. But Nelson, disliking protocol, was often seen on the captain's side. This custom perhaps accounted for his death. At Trafalgar

he was encroaching on Capt. Thomas Masterman Hardy's promenade when he was mortally wounded by a French sniper's bullet.

On descending from the weather deck, we saw batteries of muzzle-loaders, above which *Victory's* crew of 800 men strung their hammocks. The two lower gun decks, crowded as they must have been, were often their home for years.

In the gun room we saw the crude muscle-powered steering apparatus used to navigate the ship in emergencies. Her wheel shot away by a French broadside, *Victory* was steered at Trafalgar by men pulling on tackles attached to this monstrous tiller.

On the lowest of the five decks, the orlop, Nelson died. The wounded admiral early in the battle was carried below to the pit (sick bay). Here, within a few feet of the midshipmen's mess, Nelson spoke his dying words: "Thank God, I have done my duty."

Close by we noticed crude instruments used by surgeons of Nelson's time. The most impressive thing about the pit was the illumination the ship's surgeon did not have. If you would enter a dark coal bin and attempt to read this magazine with the light from one small candle, you would understand the difficulties experienced by *Victory's* surgeon, Mr. Beatty, as he worked during battle.

On the bulkhead hung a painting, executed from eyewitness accounts, showing the death of Nelson, with his surgeon, aides, and Captain Hardy grimly grouped about him.

As our tour ended, one midshipman remarked that Nelson's sailors were lucky—they had no hot, noisy, engineering watches to stand. We all agreed wholeheartedly, until a ship's officer told us it was not unusual for large men-of-war to spend two or three days coming the three miles from Spithead into the Dockyard. Later we learned that jack-tars' wives often came aboard at Spithead and stayed until the ships docked.

Several midshipmen attended a dinner aboard *Victory*. Their host was Admiral Lord Fraser, Commander in Chief of the Portsmouth area, who flew his flag in *Victory*. In wartime Lord Fraser was the Commander in Chief of the British Pacific Fleet. Lately he was appointed First Sea Lord.

One of the fortunate midshipmen reported: "We were welcomed by the OD and taken aft to Lord Fraser's cabin, the same cabin Nelson used at sea. Here we chatted with the Admiral and his other guests before entering Nelson's dining cabin, just forward of the main cabin. His silverware, candelabra, and table pieces were used that evening; and we dined and wined in the same manner as did Lord Nelson and his captains."

Admiral Fraser spun a yarn recounting *Victory's* role at Trafalgar, where she and her attendant ships wrecked Napoleon's plans for invading England. Later he pointed out a recently repaired wound in the hull—a memento of Hitler's blitz of 1940.

Princess Elizabeth Greets Midshipmen

Twenty midshipmen consider themselves the most fortunate lads in the squadron—they attended the King's garden party at Buckingham Palace (page 717). Here's how a royal guest depicts the memorable occasion:

"Our group of 20, squired by a Navy 'four-striper,' was composed of ranking first classmen, class officers, and a few youngsters. As we passed through the palace gate, we encountered throngs of Britons, eager for a glimpse of the newly engaged Elizabeth and Philip. Eight thousand dignitaries formed an almost impregnable barrier around the rear of the palace. The great number of guests surprised us; we had expected a small, informal party, and everyone had envisioned long chats with the Royal Family. What an illusion!

"Princess Elizabeth, with Lieutenant Mountbatten at her side, and King George emerged from the palace and began filtering through the crowd, with an army of ushers opening a path as they slowly advanced across the spacious lawn. Also included in the royal party were a number of ranking military officers, their duty being to select a few from the encircling throng and present them to Elizabeth and her fiancé or to the King.

"Our midshipmen's group had long since dissolved, each seeking to get the closest view of the royal party. While elbowing my way into the path of the slowly advancing group, I noticed our captain had caught the eye of an ushering Air Force officer. This unexpected opportunity of meeting the Princess and her fiancé was not to be lost because of the intervening crowd. By a bit of fancy dodging and ducking and numerous apologies, I was soon standing nervously with two other shipmates, waiting to be introduced to Elizabeth and Philip.

"After the presentation, their naturalness and friendly nature quickly put us at ease. Soon we were chatting gaily and even joking as if with an old acquaintance. Philip seemed extremely interested in the Academy, and we swapped a few tales of Dartmouth and Annapolis. When questioned about his class ring, one of the first classmen slid his off and, handing it to Philip, explained the tradition behind it and its presentation at the famed June Week ring dance by his O.A.O.

"Not to be outdone by her fiancé, Elizabeth inquired about the class insignia worn on the

sleeves of the two upper classmen (mine still being quite bare from plebe year).

"Our talk, which lasted for 10 or 12 minutes, was finally interrupted by the fidgeting ushers, who realized we had more than tripled the usual allotment of time. With words of congratulation and good luck, we moved off into the crowd."

As if meeting Elizabeth and Philip wasn't enough, our guest continues:

"Later in this eventful afternoon, a few of us were able to penetrate the cordon about the other royal group with Queen Elizabeth and Princess Margaret Rose in the center. Upon being presented, two of us 'gallantly' proceeded to rescue Margaret from her seeming boredom. I was tempted to ask for a date, but not having experienced royal reactions to such a bold request, my courage failed me.

"Soon the Royal Family terminated their interviewing and sought refreshments under the awning of a spacious tent, similar to the many caterers' tents that bordered the lawn. Reports have it that the midshipmen carried out a like action with 'great boldness, fierce determination, and clever maneuvering.'

"The number of midshipmen who 'forgot' or 'misplaced' their raincapes was astounding —anything for a last fleeting glimpse of the beautiful and ornate palace interior. On agreeing that 'Operation Buckingham' had been completed successfully, we 'shoved off,' armed with a story for our grandchildren."

Down to the Balmy Tropics

Within a week after leaving England we were south of the 30th parallel, basking in the tropical sun and watching hundreds of flying fish skimming along the Gulf Stream.

In the afternoons you saw only two types of working youngsters: those carrying ammunition and others firing the never-satiated guns.

By nightfall all hands were ready to gather aft near the movie screen and enjoy an hour or so with Hollywood's stars of the present and past.

Our theater was improvised and didn't have a ticket window. Our "inexpensive" seats were sections of the deck; the "reserved seats" were boxes and benches borrowed from the mess halls; and the balcony was atop the No. 3 turret or the roof of the steel projection booth, the only permanent fixture of our theater. Although we didn't have murals on all sides and "20° cooler inside" air-conditioning, we did have a glistening canopy of stars and the night-cooled trade winds.

The warmth of the Tropics once more brought our Sunday services up to the fantail from a confining chow hall below. Your imagination may fail you if we say shipboard services are sometimes beautiful. Picture, however, this scene:

The spell cast by a humming organ, deep masculine voices, and the sound of the gentle swishing and lapping of waves falls upon you as you kneel to worship. Beneath the cloaked muzzles of 16-inch rifles stands your chaplain behind his lectern. Close by is his small portable altar. As he delivers a short, pithy sermon, a benign sun beams down from a clear blue sky. A faint breeze cools your face. Your eyes catch a rolling destroyer to starboard. Again the choir sings a familiar hymn and the service is over (Plate XVI).

Before long *New Jersey* dropped her hook in Guantánamo Bay, Cuba.* We were permitted to go ashore in our "white works," a comfortable summer uniform distinguishable from an enlisted man's whites by the blue band around the top of the hat (Plate IV).

Leaving the fleet landing, we had our choice of two roads, one running east to the Navy recreation center and its ships' service store, the other going west to the marine post and PX.

At both facilities, ice cream, canned fruit, and 35-cent steak sandwiches were plentiful. Stores were well stocked, and smart lads who saved their cruise allowance could now take advantage of Guantánamo's bargains. Most of our gifts for the folks at home were bought here tax free.

During our first liberty the youngster class was introduced to Chief Hatuey, a famed Indian rebel of early Spanish days, whose face (mostly nose) adorns bottles of Cuban beer sold on the station. There's a saying that "you can't beat the Chief—he always wins." After a few of his beers we understood why.

We Bombard Culebra, a Target Island

On our departure from Cuba we began gunnery practice in earnest. Now we were going to find out if all the hours spent on dummy shells had been worth while. For the first time the big 16's were to be fired.

Our target was Culebra, a small island off Puerto Rico reserved by the Navy for fleet gunnery practice. We commenced bombardment at 0900 one clear morning.

We sailed up and down our firing track rifling our 5-inch and 16-inch shells into the beach. Control officers and range-finder operators kept a close watch on *New Jersey's* shooting as well as on the work of her sister and rival, *Wisconsin.*

Shortly after noon, our mission completed,

* See, in the National Geographic Magazine, "Cuba—American Sugar Bowl," by Melville Bell Grosvenor, January, 1947.

"Secure from General Quarters" was piped throughout the ship.

That afternoon the Task Force rendezvoused and we steamed off. We were on the road back.

Virginia Gives the "Welcome Back"

On August 12 the Virginia coast materialized out of the offshore mist.

As if trying to surpass European hospitality, the people of Tidewater Virginia went all out to entertain the midshipmen. Norfolk gave two grand balls.

Virginia Beach was swamped with middies and their hostesses. Rare was the fellow who couldn't boast that he had been looking at the pigeons, minding his own business, when a beautiful girl drove up in a shining convertible and asked, "Going to the beach?"

We devoted the last week of our cruise to night gunnery and submarine warfare. All men in the first class were dispersed among destroyers and submarines. The rest of us were assigned to antisubmarine lookout watches.

During the day the U-boats split up, five to each of the two battleships, and simulated attacks on us. They fired dummy torpedoes set to run five feet below our maximum draft.

Many of us believed that spotting a periscope was an easy task. Experience revealed our error.

In establishing a position to fire her "fish," a sub raises its periscope only momentarily. Even if a gunner knows the scope's position, he has a difficult task picking out that "eye" among the whitecaps.

There were many tales in evening "bull sessions" of a lookout's spotting a submarine by first detecting a torpedo speeding at his ship.

"Tin fish" travel about 45 knots, and their trail of air bubbles appears about 75 feet behind, depending on the depth. We were thankful they had been set too deep; otherwise, as many as 10 a day would have made direct hits.

We all came to appreciate the effectiveness of the Navy's underwater fleet. Show us the man who doesn't respect the torpedo speeding directly at him!*

After sundown the 5- and 16-inch batteries were put to work firing on target sleds towed by tugs.

These night-firing exhibitions were spectacular and, in fact, enjoyable once we got used to the roar of the 16's and the ear-splitting cracks of the secondary battery.

Barrages began with the 5's firing star shells to light up the target. Then, its turrets trained, the main battery let go with 2,700-pound calling cards.

These weighty shells are sped by brilliant orange flames flashing 30 feet beyond the muzzles. Instantly, light vanishes, and the ship is left in darkness. As your ears recover, you hear the shell cleaving the distant atmosphere. The sound resembles the swoosh of a jet plane. Long after firing has ceased, you remember the shell's weird moan.

Midshipmen Get Air Training

Meanwhile the second classmen, quartered aboard the carriers, were getting instruction in naval aviation. In Avengers and Helldivers they made observation hops lasting two to three hours. The purpose of these flights was to acquaint them with air power's role in naval tactics.

Riding rear seats, they were in constant communication with their experienced pilots, who gave them a play-by-play description of what was going on. Before each flight they were briefed in ready rooms along with the pilots, and on landing they returned to get a full explanation of the maneuvers.

Four days out of Annapolis one plane went into the drink. Within five minutes pilot and midshipman were picked up by a destroyer, while an anxious helicopter hovered overhead.

Between firing runs we cleaned, scrubbed, and painted *New Jersey* to make her shipshape for home-coming.

Heretofore, first class had told us, "Scrub that hatch," but now our class ran the show. Classmates served as division officers and bosun mates.

Realizing that leave was but a few days away, we sang lusty chanteys as we worked. Decks and brass were never cleaner.

Jersey's Anchor Rattles "Home"

As the Task Force steamed up Chesapeake Bay, we packed our gear and said "So long" to the Navy regulars who had been our shipmates.

We appeared off Annapolis the night of August 25-26, and, as tradition demands, the senior class's "anchor man" (who has the lowest standing) knocked open the pelican hook of the anchor chain. The huge links rattled across the forecastle and the hook splashed home.

Dawn lit the Chapel dome and the radio towers on Greenbury Point. Motor launches put out to meet us. Midshipmen's cruise was over.†

* See "Your Navy as Peace Insurance," by Fleet Admiral Chester W. Nimitz, NATIONAL GEOGRAPHIC MAGAZINE, June, 1946.

† For additional articles on the U. S. Navy, see "NATIONAL GEOGRAPHIC MAGAZINE Cumulative Index, 1899-1947."

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Good-bye, Textbooks—Hello, Salt Water! 2,100 Midshipmen Start a Training Cruise

Carrier, battleship, and destroyer lead *New Jersey* on the Naval Academy's first cruise into north European waters in nine years. Middies, putting classroom theory into practice, learn shipboard duties.

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Kodachrome by B. Anthony Stewart

On a Carrier's Bridge, an Array of Eager Faces Scans the Prospect of Liberty on a Foreign Shore

Randolph's starred ribbons show she served in the Atlantic and off the Philippines, and was hit twice during three Pacific battles.

On the Captain's Deck, Academy Officers Get the Day's Orders

"All hands to quarters for muster!" This call dates back to the earliest days of the United States Navy. Upon hearing it, *New Jersey's* midshipmen officers hurry to the captain's forward deck.

Here the midshipman unit executive officer reads the morning's orders and sets forth the current "do's" and "don't's" for the Annapolis contingent.

Wearing dungarees, seven first-class midshipmen division officers take notes. Later they'll pass out all the "hot dope" to their shipmates at division parades.

Men in the front rank are naval officers attached to the Academy and assigned to the cruise to instruct the midshipmen.

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IV

Kodachrome by Alexander G. B. Grosvenor

***New Jersey's* Liberty Party Skims past *Wisconsin* on Its Way to Inspect Guantánamo Bay and the Cubans**

Soft hats with narrow blue bands denote midshipmen youngsters just graduated from the plebe class. Visored caps are worn by first classmen, or seniors.

"All Hands Air Bedding!" The Order Rings Every Guntub and Festoons the Life Lines

On a sunny day once every two weeks the call is sounded over the ship's public-address system. Soon topsides are covered with blankets, mattresses, and flapping white mattress covers. Seagoing "housemaids" (right) seize the chow-hour opportunity to play cards, write letters, and acquire a sun tan.

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V

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When the Boatswain's Mate Pipes, "Now Wash Down and Dry All Weather Decks," Barefoot Admirals-to-be Turn To with Squeegees

Under the watchful eye of a first-class midshipman "bosun," second-year men dry the deck lest evaporating sea water streak it with salt.

Paint the Bulkheads! Shine the Brass! Youngsters Learn the Navy Way that These Tasks Are Never Finished

Ten minutes after the middies had shined turnbuckles and pelican hooks on the life lines (right), salt air tarnished them again.

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From the Sky, an Officer Drops In on *New Jersey* for a Task Force Conference

Each morning a helicopter delivered the *Cruise News*, the squadron's daily newspaper, published aboard *Wisconsin*. Always an interested group turned out with cameras. Here the battleship refuels a destroyer.

IX **Summer's Classes Move Topside. Youngsters Get a Lecture on Seamanship**
Three one-hour drills a day remind these "world tourists" that they're still students.

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Reservist and Academy Man Team Up to Fix Their Ship's Position by the Sun
Some 100 ROTC (Reserve Officers' Training Corps) men made the 1947 training cruise. One of them holds a stop watch while his Annapolis shipmate shoots the sun with a sextant.

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Nursing ■ Tanker, *Wisconsin* Gulps Thousands of Gallons of Oil. *New Jersey* (Right) Makes Ready to Refuel at the Same Time

These two 45,000-ton battleships, both combat veterans, have been retired to the "mothball fleet" owing to lack of manpower.

XI **A Novice Learns How to Load 40-mm. Antiaircraft Shells**

Ammunition and guns are dummies, producing only loud noises.

Left: An officer prepares to ride a "Halsey chair" across a taut line to a ship alongside. If the lines slacken, he'll get a ducking.

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***New Jersey's* 16-inch Guns Scowl on Midshipmen Making Merry in a "Happy Hour," Their Own Uninhibited Horseplay**

Here, to the crew's delight, the boys are free to caricature the skipper or exec. Boxing and wrestling exhibitions are always popular.

Gun Loaders, Timed by Stop Watch (Left), Train for Speed on ■ Dummy 5-inch Mount

Faster and faster they heave in powder cases and shells, until they become as proficient as bluejackets. This practice loading machine duplicates an actual gun save for twin barrels and turret housing.

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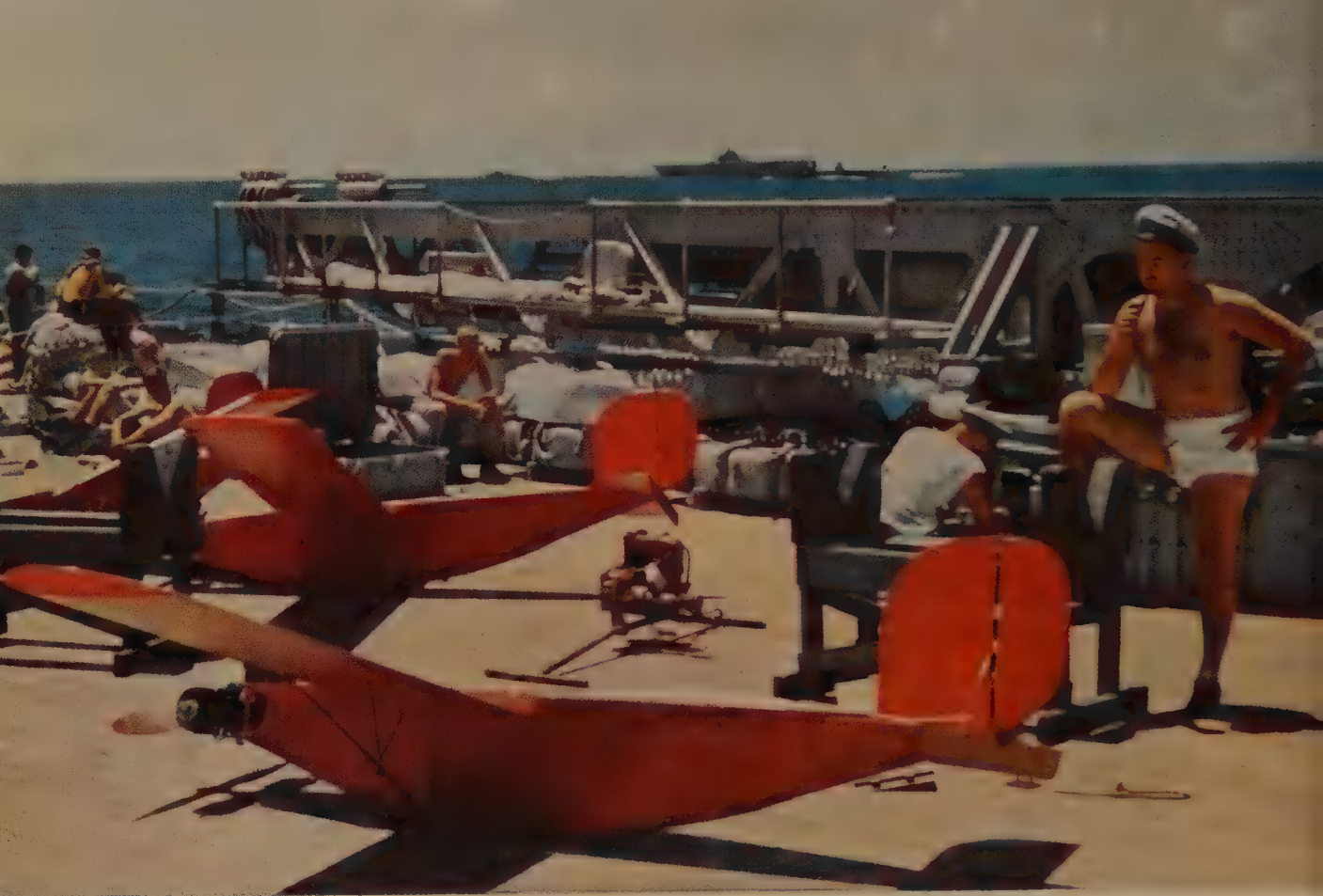
100 Pounds of Backache

"Pass the Ammunition" is more work than song. Hauling the tins up six decks quiets any singing.

Kodachromes by Alexander G. B. Grosvenor



XIV **Toy Planes, Steered by Radio, Give Middies Practice in Antiaircraft Gunnery**

Usually the battleship's gunners fire at sleeves towed by a carrier's planes. Now these catapult-launched drones, diving and twisting, will simulate the unpredictable tactics of *kamikaze* pilots.

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Kodachromes by Alexander G. B. Grosvenor

Youngsters Use Elbow Grease to Haul Overflowing Laundry Bags Aft: Guantánamo Bay

As most ships are equipped with washers, only an ambitious lad need do his own laundry. The chance of getting it all back is almost nil, but that's better than doing it yourself.

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Middies Soak Up Lifeguard Tan in the Caribbean to Impress Their Girl Friends

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***New Jersey's* Guns Are Muffled; the Heads of Fighting Men Are Bowed in Prayer**

Under the open sky, divine service was held each Sunday, just as it was at the Naval Academy's chapel during the school year. Men were not required to attend, but usually all turned out.

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Kodachrome by B. Anthony Stewart

Scotland! The Highlands! A Boatload of Anticipation Approaches the Forth Bridge

From 10 a. m. until midnight naval education ceased so that these midshipmen and enlisted men (soft caps) might broaden their horizons. Five days' liberty in Edinburgh taught them that Scots were much like Americans.

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Kodachrome by B. Anthony Stewart

Yanks and Scots Exchange Visits. Liberty Boats, Having Landed Midshipmen, Take On Civilians for a Tour of the Squadron

On a Misty July Morning Three Scottish Lassies Proudly Show Two Americans the Sights of Edinburgh

"Auld Reekie" lives up to its smoky reputation as a train steams past. The old castle rises above Princes Street Gardens. On fair days the park and hillside were dotted with midshipmen and their "drags" (girl friends). Huge crowds gathered when Navy bands from the squadron gave concerts in the park.

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Midshipmen and Schoolgirls Look Down from the Parapet of Edinburgh Castle into Princes Street Gardens

Tall Gothic spire is a monument to Sir Walter Scott. The railroad station-hotel's clock gleams through the mist (right).

A Highland Sentry Leads a Tour of the Castle, Stronghold of Scottish Fighting Men for 13 Centuries or More

This veteran sergeant bears the sly look of William Bendix, the motion-picture actor, bent on a rascally mission. In fact, he is entertaining the Americans with a horror story of what Scotland's national drink will do to their insides if they don't watch out.

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Lads and Lassies Practice a Highland Dance on the Sod in King's Park, Edinburgh

Here the photographer got unexpected recruits when a band of children, going home from school, stopped to watch proceedings. Arthur's Seat, a hill of volcanic origin, rises in the background.

© National Geographic Society

Kodachromes by B. Anthony Stewart

Partners Whirl in the Strathspey and Reel; a Midshipman Takes a Bagpipe Lesson

These girls are the champion Highland dancers of 1947. They are to Scotland what prize-winning bathing beauties are to the United States. Girls wear Napier tartan (left, below) and dress Buchanan.

© National Geographic Society

Kodachrome by B. Anthony Stewart

Midshipmen Love Photography. At Times the Cruise Resembled ■ Camera Club in Action

This young man takes a color shot of the Princes Street floral clock. Edinburgh's music festival accounts for the composers' names. A ladder enables the gardener to pull weeds without injuring the flowers.

XXV **Scotland and America Cement a Friendship Beneath an Umbrella Built for One**

The girl on the right is the hostess at an Edinburgh garden party (below).

Ektachrome by Alexander G. B. Grosvenor

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Kodachrome by B. Anthony Stewart

A Toast to Four Fair Lassies Is Proposed in Scotch and Drunk in Tea

A. H. Alexander (right), an automobile distributor, gave the party for the midshipmen. His daughter, Joan (foreground), invited three of her girl friends. Everyone looks happy but the dog.

Thatched Roof Realizes the American Vision of Rural England

From the standpoint of comfort, thatch has no advantage over slate or shingle. In fact, some tenants complain that the straw invites nesting birds and mice.

However, thatch appeals to persons who love to re-create the past, especially those of retirement age. Where an aging American dreams of settling down on a Florida houseboat or in a California orange grove, an Englishman creates fond images of a thatched cottage in a cool, green village.

This elderly cyclist spent a large part of his life in the American Tropics. Upon finishing his work, the construction of a railroad in Brazil, he retired to Ringwood, a village on the outskirts of the New Forest.

Having read of the midshipmen's visit to near-by Portsmouth (Plate XXVIII), he was not surprised one day to find them pointing their cameras at his home. Pleased by their admiration, he invited them to tea with his wife.

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Kodachrome by B. Anthony Stewart

Who Built It? When? And Why? Middies Ask at Stonehenge, Prehistoric Britons' Monument to Forgotten Gods

Archeologists believe this circle served as a sepulcher or a sun temple. Britain's guided tours made a hit with the Annapolis lads.

© National Geographic Society

Kodachrome by B. Anthony Stewart

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U.S.S. *Randolph*, Commissioned in 1944, Moors Close to H.M.S. *Victory*, Launched in 1765

At Portsmouth docks the American midshipmen form a square and watch British seamen drill and perform the sailor's hornpipe in their honor. Admirals of the two nations review proceedings from *Victory's* deck.

Kodachrome by B. Anthony Stewart

On the Quarter-deck Lord Nelson Fell Mortally Wounded at the Battle of Trafalgar

Victory carried the flags of many famous admirals. Under Nelson, she saw Napoleon's hope of naval supremacy dashed. Englishmen make pilgrimages to *Victory* as Americans do to Mount Vernon.

© National Geographic Society

Kodachrome by B. Anthony Stewart

A Jungle of Weeds and Wildflowers Grows on the Grave of Historic London Landmarks

Midshipmen, guidebooks in hand, survey the bomb damage around St. Paul's, which escaped destruction as if by divine intervention.

Off Portsmouth a Nostalgic Band Stands on *New Jersey's* Stern and Watches *America* Sailing Home

Soon the midshipmen will head south to Cuba. Just ahead of the liner, an antiaircraft island springs out of the Solent.

© National Geographic Society

Kodachrome by Alexander G. B. Grosvenor

XXXII **A "Beefeater" Guides an Annapolis Company Through the Tower of London**

Yeomen warders, a semimilitary force uniformed in antique style, are quartered within the Tower with their families. This man got his job as a reward for war service (note his ribbons).

© National Geographic Society Kodachromes by B. Anthony Stewart

A Scarlet Mob Queries a Future Officer about the Hard Life of an Old Salt

These lads attend Melville College, a public (meaning private) school formerly called Edinburgh Institution. How they keep jackets clean can be answered only by the fact that they don't wrestle in them.

Sea Bird Cities Off Audubon's Labrador

By Arthur A. Allen

Professor of Ornithology, Cornell University

With Illustrations from Photographs by the Author

FROM vast reaches of the sea, bizarre birds congregate to breed on islands in the Gulf of St. Lawrence south of the lonely Labrador Peninsula, which John James Audubon more than a century ago called "wonderfully grand, wild—aye, and terrific."

Those adjectives still apply, as we discovered on a trip for the National Geographic Society to photograph in color the sea birds the great naturalist painstakingly drew and painted. Often he worked 17 hours a day to draw details of color and form that cameras now catch in split seconds.*

All traffic to the north shore of the Gulf is by boat in summer and dog sledge in winter, or by plane, since no roads reach into this wild region. Though actually a part of Quebec, it is still often called Labrador as it was in Audubon's day (map, page 759).

Kittiwake Homes on Sheer Cliffs

Leaving our station wagon at Rimouski, Quebec, on the broad estuary of the St. Lawrence River, Mrs. Allen and I boarded the steamship *Matane I* and arrived next morning at Seven Islands (Sept Iles), on this coast of storms. There we were met by Game Warden Ben Bijoud, who had instructions from Ottawa to take us to the bird sanctuary on Carrousel Island near by. Like everyone else on the coast, he went out of his way to be helpful.

It was June and a new generation of birds was just emerging. On two of the vertical cliffs facing the sea we found 300 nesting kittiwake gulls.

Kittiwakes derive their name from their three-syllable call. About the fishing banks they are among the most familiar birds, especially in winter. Then they often assemble in thousands and are known as "winter birds." They never venture inland, however, and are rare even about the harbors, where they are called "offshore gulls."

Unlike most other species of gulls, the kittiwakes always select narrow shelves on sheer cliffs for their homes and build substantial nests of seaweed which will not blow off in the storms that so often batter the rocks below.

Landing at the foot of the cliff in the lighthouse keeper's boat, we rigged up a blind on a ledge about 20 feet from the nests.

Luckily, the birds paid little attention to the blind. Soon after the boat disappeared, they came back, and I was able to observe them at close range. Their dark eyes gave them a much gentler expression than the pale-yellow eyes of other gulls on this coast, and their small black feet were likewise distinctive.

Day-old youngsters, visible in some of the nests, were covered with fluffy pale-gray down without the dark spots that are so conspicuous on most young gulls.

My contemplation of the home life of these interesting visitors from the high seas was suddenly interrupted by a gust of wind that caused the blind to careen. In my efforts to hold it in place, I felt one foot slip from the ledge and had a momentary vision of camera, blind, and photographer plunging into the sea thirty feet below.

It proved fortunate that we made photographs the first day, because thereafter we had high winds or fog which would have made the approach to the cliffs most dangerous.

On Carrousel Island there was also a colony of some 1,100 herring gulls. A few great black-backed gulls, or "saddlebacks," and a couple of hundred razor-billed auks and black guillemots were incubating their eggs in the numerous fissures in the rocks. About 150 eider ducks were breeding on the island, and more than 300 double-crested cormorants could be seen nesting in the tops of the dead spruces on the highest part of the island.

Miss the Boat and You Wait a Week

From this lonely rock of whirring wings and raucous, haunting cries, we returned to Seven Islands to catch the steamship *Sable Isle,* scheduled to dock the next morning at 6 on its way to Harrington Harbour.

* Dr. Allen, a pioneer in color photography of birds, is making a comprehensive series of color plates of the principal species in various sections of North America under a grant of funds from the National Geographic Society. One hundred and nineteen of his remarkable color photographs of birds have appeared in previous issues of the National Geographic Magazine as illustrations for the following articles: "Birds of Timberline and Tundra," September, 1946; "Sights and Sounds of the Winged World," June, 1945; "Touring for Birds with Microphone and Color Camera," June, 1944; "Birds on the Home Front," July, 1943; "Ambassadors of Good Will," June, 1942; and "Stalking Birds with a Color Camera," June, 1939, all by Arthur A. Allen. Dr. Allen's contributions to the National Geographic Magazine also include "Hunting with a Microphone the Voices of Vanishing Birds," June, 1937.

Because of the wind we saw few birds in the spruce woods behind the village. But ruby-crowned kinglets, fox sparrows, redstarts, and yellow-bellied flycatchers were not uncommon; and along a sandy ridge covered with spruce and scattered jack pines we found a pair of yellow palm warblers, as Dr. Harrison F. Lewis had promised us we should.

It was Dr. Lewis who first introduced me to this coast in 1928. Then Chief Federal Migratory Bird Officer for Ontario and Quebec, he had explored the north coast for sites for sea bird sanctuaries in 1925, as provided for by the treaty of 1916 between Canada and the United States for protection of migratory birds. His successor, Dr. Oliver H. Hewitt, was awaiting us at Harrington Harbour.

Not at 6 but at 4 in the morning, Mr. Bijoud rushed to the inn with the news that the *Sable Isle* had already docked and probably would stay only 15 minutes. We were dressed and had moved our 12 pieces of luggage to the pier in 14 minutes and 55 seconds.

This was our first taste of the advertised "vagabond cruises" along the north shore. Because of whims of wind, fog, and tide, no definite schedule of arrival and departure can be maintained, and the passenger who isn't ready will wait a week for the next boat.

Once aboard, if he is lucky he gets a cabin, but if there are many passengers—and there often are—he may have to be content with the dining salon upholstery.

Decks are crowded with oil drums which, though empty, permeate the air with the odor of seal or cod. At his destination the "vagabond" is as likely to be cast ashore in the middle of the night as at noon, and he may walk down a gangplank in a dignified manner or climb down a ladder into a bobbing dory.

After braving the chill blasts that whipped off the icebergs to the east, we found a warmish spot in the lee of the pilothouse where friendly fumes from the kitchen poured out of a ventilator.

Montagnais Indians Crowd the Wharves

Most of our fellow passengers were fishermen and small businessmen traveling from town to town. But some were sportsmen heading for clubs on the Moisie, the Godbout, or other famous salmon streams, and still dreaming about the big ones that got away last year.

Others were young men taking summer jobs with construction companies. A few were girls returning from school or employment in Quebec and Montreal and looking forward to the simple pleasures of their rugged homes.

On the boat was an interesting admixture of Anglican ministers and Catholic priests. Their flocks included many Montagnais Indians, who crowded about the wharves to shake the clergyman's hand and hear his words of encouragement—the men white-jacketed and gaunt, the women bulky and ungraceful in their voluminous multicolored petticoats and tight bodices.

Invariably the Indian women dressed their black hair as of old, rolled into buns over their ears. Atop this coiffure they perched their time-honored but unbecoming liberty-bell hats, broadly striped with red and blue.

Despite their uncomfortable costumes, their bowlegs and swinging hips, the women are remarkably hardy. Women and children travel with the men up the rocky streams for hundreds of miles in late summer to trap all winter in the interior.

They all come out in the spring to trade their furs at the Hudson's Bay posts for the next year's provisions, but during the summer they loiter about the posts, do a little fishing, repair their canoes, and rest up for the next trek into the interior.

Cold Breath of the Labrador Current

To the eastbound traveler along the coast, the effect of a branch of the cold Labrador Current, which flows through the Strait of Belle Isle, becomes more and more apparent. Trees become stunted and disappear; rocks with a deep covering of reindeer moss, curlewberry, and other creeping or sprawling vegetation take their place.

The shore for hundreds of miles is broken up into innumerable islands surrounded by waters studded with rocks and reefs which plague the mariner.

Trees, sometimes of fair size, grow along the sheltered stream valleys on the mainland, but elsewhere, for every acre of trees, there are a thousand acres of moss stretching far inland until the effect of the Labrador Current is finally lost.

The interior is heavily forested, but adjacent to the cold water Arctic conditions prevail; deep snowdrifts lurk behind the sheltering cliffs, and icebergs float with the current in mid-July.

We reached Harrington Harbour in two days. There we were met by Dr. Hewitt and his boatman, Samuel Robertson V, in the patrol boat *Alca of Ottawa*, 38-foot cruiser built on the coast.

The Robertsons have lived at La Tabatière since before Audubon's time. Audubon tells of meeting with Samuel Robertson I at the same spot in 1833. So little has been the change of blood in the population of this coast

Elsa G. Allen

As if a Feather Mattress Had Burst, Gannets Cover Bonaventure Cliffs with White

On these ledges the birds have nested uncounted centuries. Accustomed to sanctuary, they treated the author (hat in hand) with indifference. As they soared past on black-tipped wings with a yard-wide spread, "they gave an impression of abstract power perfectly at home in storm or fog" (page 774 and Plates III-VI and VIII).

Dr. Oliver Hewitt

"Comparisons Are Odious," Says the Author's Wife

For two hours Elsa Allen twitted her husband for failure to match her four-pound brook trout, caught in the Blanc Sablon River. Then he landed his four-and-three-quarter pounder. On the next day he hooked a monster—"a yard long if he was an inch"—but his tackle snapped and he "quit fishing because the fish were too big" (page 762).

that our Sam had an uncle or a cousin in nearly every port we visited. He himself was as familiar with all the rocks and reefs from Harrington to Blanc Sablon as with his own dooryard, for at the age of 11 he had started carrying the mail with his father, by boat in summer and by dog team in winter.

Seeking Birds in Wind and Fog

It was now June 25, and for the next five weeks the four of us were to live snugly on the *Alca* with all of our luggage and equipment—especially snugly for the last two weeks when we had two more passengers. Fortunately, no one suffered from claustrophobia, although our heads became almost callused bumping the cabin roof, and we suffered miscellaneous bruises when the sea got rough.

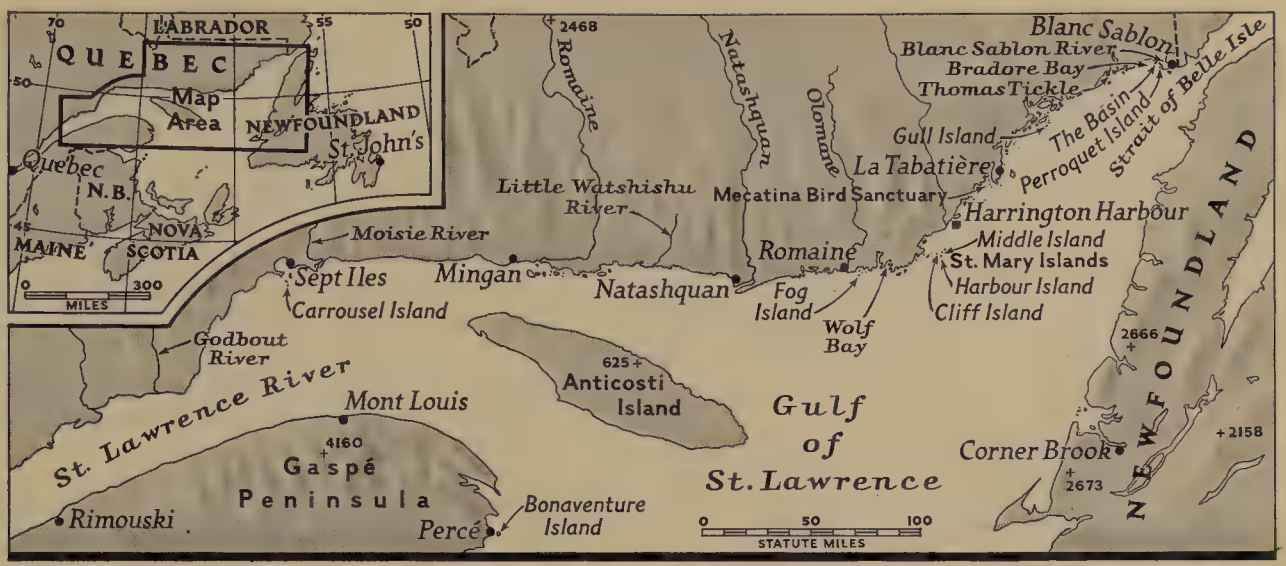
Our first official inspection was that of the St. Mary Islands Sanctuary, about 13 miles from Harrington in the open gulf. Here wind and fog have full sway and often isolate Fred Osborne, the lighthouse keeper and caretaker of the sanctuary, for days at a time.

We had good weather the day of our arrival, but during the following week fog, rain, and high wind were almost continuous. At times we could scarcely see the shore from our mooring in the narrow, well-protected harbor, and again we could see waves dashing 40 feet into the air as they hit the outer rocks.

Working fast to seize the few hours of sunshine, we explored most of the sanctuary. We took the bird census and made studies of the common cormorants and murres of Cliff Island, the red-throated loons and black guillemots of Harbour Island, and the eiders, auks, and puffins of Middle Island.

Some species, like the murres and cormorants, breed in compact little groups on cliffs which they have occupied since long before records began. Others, like the eiders and black guillemots, scatter more widely, and, although they are often seen in flocks, they nest in isolated pairs.

The guillemots choose narrow crevices in the rocks, the eiders more open spots on the tundra. Never more than one pair of red-throated loons occupies each of the small freshwater lakes, and seldom more than one pair of great black-backed gulls nests in a colony of



Drawn by Theodora Price and Irvin E. Alleman

Thousands of Sea Birds Call Quebec's Rock-bound, Fog-ridden Shores "Home"

From Rimouski to Blanc Sablon the author took a summer's leisurely voyage. On the jagged cliffs of island sanctuaries he and his companions counted 99,000 nesting birds (page 773).

herring gulls or on a rocky headland. In all, there were 16,000 to 17,000 birds nesting in this sanctuary.

Year after year the murres, returning from the open sea, show up on their nesting ledges on the same date, and each bird apparently occupies exactly the same spot it used the previous year.

Murre Returns Yearly to Same Spot

For ten years now, a single Brünnich's murre has claimed foothold on a narrow shelf of Cliff Island facing the sea. Here he stands in the middle of a flock of common murres—the tenth bird from the right and the fifteenth from the left. Storms may rage, but nothing budges him from this particular spot. Of course he leaves it to go fishing, but he returns soon to the same few square inches.

Ten years ago Dr. Robert Johnson, at that time a graduate student at Cornell, banded a black guillemot that was incubating its two eggs in a deep crevice near the mooring in the harbor. When we inspected the crack this year, lo! the bird was there again, for we could see a thin, very worn band on its little red leg.

We had an interesting time on Cliff Island with the European, or "common" cormorants. These are not common in the usual sense, since there are only three or four colonies of them on this continent. The really common cormorant of North America is the smaller, double-crested species, which occurs in one or another of its races from the Arctic to the Tropics and from the Atlantic to the Pacific.

The larger bird, with white bordering its pouch and with a blue-black neck and breast, was originally called the common cormorant because it was found also in Europe and Asia. Some of these common cormorants were still incubating eggs, but the majority had black, woolly young, a few nearly as large as their parents.

After I was safely hidden in a blind and my accomplices had disappeared over the ridge, the old birds returned to their nests all about me. Youngsters were clamoring for food, but no meals were served during the next half hour. I began to fear that I might miss the amazing spectacle, for the fog, which already concealed the sea below me, began to rise and obscure the birds.

Cormorant Cafeteria

At last, however, one little brood that had been stretching up their necks with quivering pouches began to get results. What a party it was, as both father and mother opened their blue-lined mouths and let the children dive down their throats for dinner (page 760).

During this grotesque performance the herring gulls hovered low overhead or darted into the melee whenever one of the youngsters brought out a fish too large for it to swallow.

Absorbed in the antics of the cormorants, I tarried till we had to start back to Harbour Island in fog so dense that we had to depend on the foghorn for general direction and trust to luck to avoid two dangerous shoals. Our thoughtful host became alarmed about us, however, and we had covered scarcely a mile before the chugging of Fred's motor told us he was on his way to guide us among the dangerous rocks. By the time we were back in our harbor, it was dark.

Young Cormorants Ram Their Heads Far Down Their Parents' Throats for Food

Into the gaping lunch basket this Cliff Island youngster thrusts a probing beak and fastens onto the pièce de résistance. Like a dentist pulling an obdurate tooth, he yanks his elder's head from side to side until a fish pops out. Often, when the fish is too big for him to swallow, a watchful herring gull darts down and gobbles it up. These are common cormorants (page 759).

Elsa (Mrs. Allen) had rescued a newly hatched red-throated loon from a black-backed gull, intending to give it for adoption to the pair nesting on Harbour Island. Since it was now too late an hour to disturb the loons, and since someone would have to keep it warm during the night, we matched pennies. Thus it fell to my lot to sleep with a baby loon.

Foster Mother to a Baby Loon

I fashioned a little box that would fit into my sleeping bag—large enough to give me some warning if I turned over on it, yet small enough not to dissipate the heat. The next morning the baby loon was alive and wheezing for a fish. Our next problem was to introduce him to the Harbour Island loons.

By some strange quirk in loon psychology, the youngster now regarded me as his mother. He followed me around the pond and tried to get into the blind with me. We finally had to tie him in the loon's nest until he felt acquainted with his new mother.

Fortunately, red-throated loons (Plate VII) brood their young for some time in the nest where they are hatched, returning to it from their swims on the pond whenever the youngsters get cold. Either loons cannot count or they have that same friendly spirit toward travelers in distress that we noted in the human inhabitants of this area, because I soon observed that the little orphan was definitely adopted.

Returning to Harrington after a stormy week, we visited the Grenfell Mission and hospital, the westernmost of a chain of institutions founded along the coast by Dr. Wilfred Grenfell. He felt the lure and poverty of Labrador so keenly that he devoted his life to these fisherfolk and brought them what they most need in times of distress: doctor's care and hospitals.

More recently the missions have invited teachers to help in developing new home industries, thus adding to the meager income of the families. Now many of the people devote the long winters to wood carving and making hooked rugs, for which the mission finds a ready market. Most of the doctors and teachers volunteer their services, and many a college student has passed a soul-satisfying summer at one of the Grenfell Missions.

La Tabatière, Six-family Town

Our next stop was planned for the mainland at the six-family community of La Tabatière, home of the Robertsons, in an area of stunted Hudsonian forest surrounded by Arctic tundra. Theoretically, such a sheltered area with its innumerable "edges" of woods should have supported an abundance of wildlife, but actually birds were scarce.

Fox sparrows and white-crowned sparrows were the most numerous; Lincoln's sparrows and gray-cheeked thrushes could be heard occasionally; Wilson's and black-poll warblers were not uncommon, and there were scattered Tennessee warblers, mourning warblers, and yellow-bellied flycatchers, which we know as transient visitors in the States in their passage to and from their winter homes in South and Central America.

There were, of course, some robins and juncos, a few red-breasted nuthatches, winter wrens, ruby-crowned kinglets, white-throated sparrows, and yellow warblers, so common much farther south, and a few flocks of crossbills and pine siskins, already finished nesting. The birds were so scattered, however, and the tangled spruces made observation so difficult that we were lucky if we found one or two nests in a morning's hunt.

Although offered rewards, the few children living about the harbor could give us little help. Their eyes evidently were trained for the sea, and the only land birds they knew at all were the dooryard "stripities" (white-crowned sparrows), "brown bobbers" (fox sparrows), and "brown diggers" (gray-cheeked thrushes). We had to content ourselves with studies of the fox sparrow, gray-cheeked thrush, and Wilson's warbler.

Before leaving La Tabatière we enjoyed a fine dinner at the comfortable home of our boatman's parents, Mr. and Mrs. Sam Robertson IV. Although isolated from centers of culture and industry, they keep in touch with the world of affairs by radio, and the mail-order houses enable them and their scattered neighbors to enjoy many modern conveniences.

The mail boat, piloted by Sam's brother, arrived while we were there, piled high with bags of parcel post, but with only half a bag of first-class mail for the whole coast from Harrington to Blanc Sablon.

From La Tabatière a few hours' run took us to Gull Island in St. Augustin Sanctuary and a fine colony of ring-billed, herring, and great black-backed gulls, as well as eider ducks. A little flock of green-winged teal and a few black ducks were frequenting one of the ponds; also a couple of least sandpipers and a greater yellow-legs. But none of these was nesting.

I was surprised to find eider ducks nesting within 15 feet of black-backed gulls' nests, since the birds apparently are ancestral enemies (Plates VII and VIII). The gulls never miss an opportunity to steal an egg or carry off a young eider. Indeed, the saddleback is the most unpopular bird on the coast because of these depredations.

Even among the fishermen, who, formerly at least, were accustomed to taking the eiders' eggs for their own use, the sight of a saddleback doing the same thing arouses anger; when they see one pounce on a young eider, they become quite vindictive. Often it is their own approach that gives the gull his opportunity, for the boat frightens the mother away and leaves the ducklings unprotected.

The great black-backed gulls have learned to watch for just such eventualities, and many times we ourselves, after passing a family of eiders and scaring away the mother, looked back to see a pair of blackbacks harrying the little flock. If the mother did not promptly return, the youngsters would keep diving until exhausted and then were easy prey.

Eider Routs a Black-backed Gull

I set up a blind one morning near a blackback's nest and some ten feet from an eider's nest, and awaited the arrival of either bird.

The eider came first, flying to a small pond about 100 feet from the nest and walking the rest of the way. Evidently she did not like the blind. She sat down on the rocks about 15 feet from her nest. Because of the location of the gull's nest on the end of a little ridge, her enemy's natural approach was past this rock, unless he flew directly to his nest.

Finally the gull circled about, landed beyond the duck, and started to walk past the rock where the duck was contentedly resting.

Never have I seen greater fury than the bristling rage that greeted this gull when he started to enter the eider's territory. All her feathers stood on end, her bill opened, she made jabbing motions in his direction, and then she flew at him with such force that she bowled him over.

Picking himself up, the gull grabbed a small stick in his bill and advanced toward the eider; but once again she ruffled her feathers and pointed her bill, bringing him to a dead stop. Wanting nothing more to do with such a vixen, he turned tail, walked away 25 feet, and nonchalantly sat down. There he sat for an hour.

I was obviously threatened with a stalemate. At last, however, the gull took wing, circled about, and dropped beside his eggs in an evidently unaccustomed position. He kept twisting and turning, but could not decide how to approach the eggs from that side.

What was the final outcome of the placing of the two nests in such close proximity I never learned, but I left with a feeling that, when man does not interfere, the eiders can take care of the saddlebacks all right. Undoubtedly they were doing so long before Leif the Lucky sailed the Labrador coast while searching for Vinland.

The Basin a Kettle of Fish

From Gull Island we continued our cruise in the *Alca* to Thomas Tickle, a beautiful steep-sided harbor which lay that night under a full moon. The next morning a rough run of three hours brought us to Bradore Bay. How that boat did roll! We were glad to get into the sheltered retreat of the Basin, even though it was the rendezvous of fishermen having a successful season with their cod traps.

One of the schooners, we were told, had taken 100 quintals of fish from its net one morning and found it equally loaded at night. A quintal is 112 pounds of salted, sun-dried codfish; it represents about 50 six-pound fish.

In other words, the fishermen took approximately 10,000 six-pound fish from their net in one day. That was, of course, unusual, but catches of 3,000 fish were frequent during our stay.

Stay we did for five days, because when the wind was not whipping up the sea, the fog was so thick that it would have been madness to venture forth. There was nothing we could do but read or write, but the fishermen had a full-time job and went right on cleaning their fish into the harbor.

The Basin is very shallow and the water is clear. For acres about us the bottom was white with the heads and viscera that poured overboard in an endless stream from the three schooners anchored near by. The livers were collected in hogsheads to make vitamins for pale people, and the fish themselves were split, salted, and stored away in the holds, to be dried later at Harrington or in Newfoundland at the home ports of the fishermen.

About the Basin are a couple of "summer homes" with their stages and fish sheds, but most of the fishermen come here from elsewhere, as they or their ancestors have been doing since long before Audubon's day. The two fish sheds had bars nailed across their doors and white flags flying from their roofs, indicating that they were full.

Elsa took one look at the bottom of the harbor and two whiffs of the air before she again sought refuge in the *Alca's* cabin.

But the Bradore Bay area had its pleasant side also, for though the weather prevented moving the *Alca*, we could go ashore in the dinghy and tramp the island in which the Basin is located, or row the mile to the mainland, when it was not too rough, steering by compass when we could not see through the fog.

We found a little trout stream with a couple of youngsters fishing. My first cast hooked a richly colored 10-inch speckled trout; and the boys, who were using improvised lines and bits of bacon for bait, yelled out, "That's a good hook you've got, Mister."

It didn't take long to fill the creel with small trout up to 15 inches in length, and we felt a bit set up, thinking back on the puny 7- and 8-inch ones at home. We did not know what was in store for us at our next stop at Blanc Sablon, where we were again marooned for three days.

The Blanc Sablon River is a much larger stream, stemming from a fair-sized lake some two miles inland and meandering down through the scrubby spruces and muskeg over a sandy bottom to the sea. The tide is not strong at this point, but it did not look like a trout stream to me. Nevertheless, we were shown a pool near the village, where it was said the fishing was good at the change of the tide.

Sure enough, when the stream began to flow out with the tide and the water was littered with bits of seaweed, the trout began to rise—not 10- or 12-inch fish, but 2- and 3-pounders. Elsa hooked a 4-pounder and by careful maneuvering slid it up on the sandy beach without a landing net. For two hours she lorded it over me. Then I hooked one that weighed four and three-quarter pounds on the Hudson's Bay Company scales, and my ego returned (page 758).

Fish Too Big—Quits Fishing!

The next day the storm continued, and Ollie Hewitt and I explored the river as far as the lake. On the way back we discovered a small pool, at the foot of the first rapids, in which lay a half dozen of the largest fish I had ever seen in a trout stream. They were probably salmon, but I shall never know, because my

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Whether to Sit and Warm the Eggs or Stand and Face the Camera—That Is the Question

Six feet away, the photographer's blind poses a problem for this ring-billed gull. Fish are her daily bread, but when migrating across prairies she accepts grasshoppers caught on the wing.

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II

Kodachrome by Arthur A. Allen

In White Shirts and Black Jackets, the Atlantic Murres Wear Formal Dress in Their Rock Nursery

To this barren island the colony returns every May, each pair to raise a single chick. Nests they disdain; eggs go on the bare rock. Each egg is pointed so sharply that, instead of rolling away, it pivots in a circle. Mix the eggs; each pair restores its own. "Murre," the alarm cry, named the bird.

There's "No Vacancy" on Bonaventure Island, off Gaspé Peninsula. Gannets and Their Young Blanket the Ground Like Snow

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18,000 Loving Couples Nest on Bonaventure, the Sea Birds' Skyscraper City

Once fishermen slaughtered gannets for bait; now Canada protects them. Powerful flyers, they cruise 100 miles a day or more for food. *Gannet* has the same origin as *gander;* solan goose is another name.

Kodachrome by Arthur A. Allen

Gannets Bleach Penthouse Ledges; Gulls Stake Claims on the Ground Floor

Gannets spear fish with 100-foot dives from the air, splashing water 10 feet. Their skin's pneumatic cells cushion the blow. Fish nets 14 fathoms deep have trapped diving gannets.

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Like Marble Statues, Bonaventure's Gannets Stand in Cold, Motionless Dignity

An overstuffed youngster looks like a black-tipped powder puff. Born nearly as bare as a human, he now wears down. At 13 weeks he'll outweigh his parents, so he must starve and reduce before flying.

VII **Water's Expert Swimmer, the Red-throated Loon, Is Land's Clumsy Waddler**

Her kind summers across the entire Arctic. Florida sees some in winter; then the red throat mark disappears. Weird and harsh, the loons' maniac cries have been mistaken for the yells of attacking Eskimos.

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Mamma Eider Plucked Her Breast to Line Her Unborn Children's Home with Down

This American eider nests off Quebec, where surplus down is gathered to make soft, warm quilts. Once the ducklings have hatched and dried, they run for the sea. Mothers often pool broods into flocks of 50.

VIII **Wings Stretched, Head Wagging Side to Side, a Gannet (Left) Avows His Love**

Three birds (right) remain aloof. Another grooms its tail. The remaining one, bestowing a benevolent look, admits she's touched. Gannets thus perform before their young, as if to teach courtship ritual.

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Kodachromes by Arthur A. Allen

Great Black-backed Gull, the Atlantic Pirate, Nurses a Brood of Little Buccaneers

Lacking fish, this bold bird steals the eider's eggs and downy young. Blackback is the largest gull along our eastern coast. Occasionally it visits Florida. Usually it leads a hermit's life, shunning large flocks.

tackle in my inexperienced hands was too light for them.

The first one took the same fly that had landed the big trout the day before. He started up the rapids some ten yards until I knew I had him well hooked.

What I should have done at this point I do not know, for the fish certainly had things his own way. With a rush he cleared the water—a yard long if he was an inch! My only heavy leader parted in the middle. For the first time in my life I quit fishing because the fish were too big!

The following day the weather cleared somewhat and we were able to see the northern tip of Newfoundland across the 20-mile Strait of Belle Isle. We headed back toward Perroquet Island in Bradore Bay Sanctuary, easternmost of all the sanctuaries.

A cod net was anchored a couple of hundred yards offshore, and puffins in a large flock were having an amusing time balancing on the floats. We feared for their safety, but when we circled the net we could find only one bird that had become entangled.

A worse tragedy had befallen a half-dozen of the birds that had ventured into a seal hunter's shack from which most of the roof had blown off. Apparently the door had closed while they were inside, and they could not rise abruptly enough to fly through the open roof.

Ollie Hewitt estimated that 48,000 puffins were nesting on this island, which for hundreds of years has been honeycombed with their burrows. But on the day of our visit most of the birds were away fishing or incubating in their burrows; no more than two or three thousand were in the water about the island.

Puffins Have Big and Little Foes

While waiting in a blind for the return of the puffins, I became unpleasantly aware of armies of ticks crawling around the rocks, apparently waiting for the same birds that I was waiting for. We became well acquainted, if not intimate, during the ensuing wait. I have often counted the minutes while waiting for a tardy friend, but this time I counted the ticks, and if someone had told me there were sixty ticks a minute, I could readily have believed it.

How the puffins have survived the attacks of these hordes of bloodsuckers through the ages, and, indeed, how the ticks can thrive in this Arctic climate, is difficult to understand.

Nor are the ticks the puffins' only enemies. When Audubon visited Bras d'Or (as the bay was called in 1833), his son John collected a pair of gyrfalcons whose nest revealed remains of puffins. From my blind I watched a peregrine falcon strike down one of the puffins near its burrow, and before we left the island we found evidence of six other fresh kills.

The sanctuary is well protected now from "eggers," but the natural destruction of these charming, quizzical little birds continues and keeps them from overpopulation.

Many razor-billed auks and common murres were nesting under the gigantic jumble of stone slabs that line the shore, while on top of the island were several pairs of horned larks and pipits. Elsa found a beautiful pipit's nest, with six brown eggs, built in a curious triangular cavity in the reindeer moss atop a small boulder.

As the weather again became threatening, we left this interesting island and headed back to St. Mary Islands. The numbers of gannets cruising back and forth seemed to have increased since we traveled eastward. We heard Hudsonian curlews passing overhead, already started southward on their fall migration.

Black Flies a Scourge at Mecatina

At Mecatina Bird Sanctuary the black flies were unbearable. In spite of our efficient deterrent, they attacked our eyelids and ears and crawled down our necks wherever we neglected to smear the fly dope. At St. Mary Islands, however, they were comparatively scarce.

Here two other passengers joined us: Ollie Hewitt's brother-in-law, Tom Barry, an ardent fisherman looking for a rest from his strenuous paper business in Madawaska, Maine; and Louis Le Mieux, a student at Laval University, Quebec, who had been left at St. Mary Islands to study the great black-backed gull.

The following day Ollie and Tom went jigging for cod while Elsa and I photographed guillemots. Ollie explained to Tom that the harder he jerked the line, the larger the fish he would catch.

Tom gave the line a mighty tug and hooked one of the largest cod caught on that part of the coast—60 pounds, ten times the weight of the average cod.

With six on board we scarcely rattled around, even when the sea was rough. Two had to sleep on the tiny deck and pray it would not rain. Drying out sleeping bags was next to impossible.

Continuing our journey westward, we alternated bird islands with trout streams, putting in the good days in blinds with the birds and the foggy days with the fish.

Between Wolf Bay and Romaine is the Fog Island Sanctuary, low-lying rocks exposed to the storms of the open Gulf. Landing here is often dangerous or impossible. We were

On the Downstroke a Robin's Feathers Overlap and Grip the Air

On the upstroke, the high-speed camera shows, they open by turning edgewise (page 775). These sleepy nestlings are too young to have acquired good vision. They do not recognize the home-coming parent until his feet have touched the nest, a bowl of mud, grasses, and weed stalks just outside the author's window. A little later they'll sit up and take more notice (pages 773, 776-7).

lucky in having a couple of fairly quiet hours so that we could visit a colony of murres and cormorants nesting in a much more accessible place than most, on broad, shelving rocks where we could easily walk among them.

The young murres were now nearly one-third grown and about ready to go to sea. Although they nest in dense colonies (Plate II), the murres, like the auks and the puffins, are rather solitary during the rest of the year. When the young are two or three weeks old, each family with its one chick goes off by itself to the open sea, where the youngsters finish growing up.

On an adjacent island was a fairly large colony of Caspian terns and ring-billed gulls (Plate I) with young now well feathered, scampering over the rocks, and even swimming out to sea.

The wind freshened while we were there, so we had to pull anchor and start for Romaine in a rough sea. Held up here for a day and a half by high winds, we explored the Olomane River, a beautiful salmon stream, and visited an encampment of Montagnais Indians on high rocks overlooking the bay and village.

From Romaine to Natashquan is a dangerous part of the coast for small boats, with no

Arrow Points to the Alula, or False Wing; the Worm Is Aimed at Gaping Targets

Clarified by the speed flash, the alula and the rudimentary primary just back of it are seen extended. A possible explanation is that these break the air flow and destroy its lifting power (page 778 and Plate XII). These baby robins are a few days older than they were as shown on page 772. Now that eyes focus, they give mother a rousing welcome.

shelter from the sea. We covered these sixty-odd miles in fairly good time, however, and before dark slid into a beautiful little harbor at the Little Watshishu River.

Expedition Counts 99,000 Birds

At Mingan, which we reached the next day, we were cordially entertained by Lt. Col. E. P. Kern, of the U. S. Air Forces, who built and operated the modern airport there. Mingan was an important landing field on the main northern route to Goose Bay, Labrador, and thence to Iceland.

Dr. Hewitt's inspection trip was now completed. We had visited all of the sanctuaries along this coast and counted 99,000 birds using them for rearing their young. The *Alca* could now be put up for the winter; Sam Robertson would return to La Tabatière and Ollie Hewitt to Ottawa. Elsa and I would circle the Gaspé Peninsula before returning to Cornell.

What a different country this proved to be from Audubon's Labrador! The highway followed close to the long, smooth shore. Except in a few places, the rocks were concealed by luxuriant hayfields, gardens, or forests. Goldenrod, fireweed, and vetch made great blotches of color, and the sky was a deep blue.

Thrifty homes, neat villages, horses, cows, sheep, and all those things which we had not seen for over a month enchanted us after the wild north coast. We were bound for picturesque Percé and Bonaventure Island.

Lying two miles offshore, Bonaventure Island presents to the sea a series of ledges as its soft conglomerate rock heaves off in huge blocks during winter (p. 757). These ledges, since time immemorial, have been the summer home of the strange and spectacular sea birds known as gannets. As large as some geese, they are snow-white in plumage, with black tips to their wings and an orange-buff wash to their heads (Plates III-VI and VIII).

Not shy, the gannets permitted close approach and proved to be the answer to a bird photographer's prayer. Their black-faced youngsters were still covered with long, fluffy white down which gave them the shapeless appearance of giant powder puffs with black handles.

Gannets spend the greater part of the year on the open sea, plunging like animated javelins from high in the air at the luckless mackerel or other fish that dares venture close to the surface. As they glided past us at the edge of the cliff, they turned their heads and surveyed us with a cold gray eye encircled by blue. They gave an impression of abstract power that is perfectly at home in storm or fog or whatever the wild sea has to offer.

A New Light Dawns on Bird Photography

IT ALL happened so quickly I could not see what occurred; yet here it is before me as clear as the printed page.

First I had heard the distant call of a female Cooper's hawk and seen the answering excitement of her youngsters six feet in front of the blind. A darting shadow, a flash, and the mother bird stood there glaring at me with fire in her eye. One foot grasped the branches of the synthetic nest we had built at the base of the tree; the other held a plucked starling.

But so quickly had the hawk come that I had no mental image of her in the air. I could not tell how she held her wings or tail as she approached, or whether her talons were withdrawn or fully extended. I did not even notice that she had food in her bill. I might have supposed she carried it in her claws, for she certainly had it in her foot when her image finally fixed on my retina.

Speed Flash Reveals the Unseen

A little experience with the speed-flash camera had trained my fingers to press the shutter release at precisely the right instant, so that the resulting flash of 1/5000 of a second's duration occurred when the image of the bird was passing the middle of the film. And behold, here is the whole story as I should like to have described it, and as you can now see it for yourselves in natural color: the frozen action of a predatory hawk returning to her young with a plucked bird in her bill (Plate XIV).

Caught is the look of expectancy and hunger in the eye of one of the youngsters; one sees the strength in the pinions of the old bird, and the powerful talons reaching out to grasp the nest. The colors are natural and true.

A few years ago we would have branded such a photograph a "nature fake," impossible for any camera to produce, but today it is fast becoming commonplace.

Dr. Harold E. Edgerton, of the Massachusetts Institute of Technology, first brought to the attention of eager naturalists and wildlife photographers the wonders of the new high-speed flash apparatus with his book *Flash!* and later with his marvelous hummingbird photographs in the National Geographic Magazine for August, 1947.

Dr. Donald R. Griffin showed the possibilities of Edgerton's apparatus in photographing bats for the July, 1946, National Geographic, and Ernest P. Walker and Edwin L. Wisherd used a similar portable speed flash in making the phenomenal photographs of flying squirrels in the May, 1947, National Geographic.

My Cooper's hawk project was one of several interesting experiences during the season of 1947 when I applied the new light to old problems in bird photography.

Steve Eaton, a graduate student at Cornell, found the hawks' nest 65 feet up in a white ash tree in a dense wood lot about ten miles north of Ithaca, New York.

The tree was the tallest in this part of the woods, so there was no possibility of placing a blind in an adjacent tree.

When the eggs hatched the first of July, it occurred to me to test a new method of study which, if successful, would permit us to get a more or less complete record of what and how a Cooper's hawk feeds its young, and to

Papa Opens the Shutters of His Own Venetian Blind (Page 778)

On the wing's upstroke each flight feather turns on edge to minimize resistance of the air. A racing oarsman uses the same technique in "feathering" his oar.

reveal each rapid action by high-speed flash photography.

Accordingly, with the help of an expert climber, Paul Shepard, a student in the summer session, I built a dummy nest in a bushel basket and hung it beneath the real nest when the young were about five days old.

The hawks paid little attention to this innovation, so we transferred the young to the basket. A few hours later, the female flushed from the basket at our approach.

Next we built a blind on the ground, covering a framework with burlap. Then, during the next week, we lowered the basket ten feet a day until it was fastened to the trunk of the tree ten feet from the ground.

Perhaps the hawks were surprised at the rapid settling of the foundations of their home, but they continued to feed and brood their young with no apparent misgivings.

Later we successfully substituted for the basket a less conspicuous potato crate.

To complete our preparations, we rolled a stump against the base of the tree and built a dummy nest on top. Thus, when we were ready for our observations and photography, we had only to move the youngsters from the crate to this new bungalow in front of the blind.

Even when we added a 4-foot-square, light-blue backdrop behind the nest, the old birds continued to feed and the youngsters

Robin's Eye Winks, Not in Flirtation, but in Automatic Self-preservation

As the bird lands, the high-speed flash shows the nictitating (winking) membrane half-drawn across the eyeball. This device protects the eye against jabbing beaks as well as earthworm slime (opposite, and page 787). As a protection against dust, it functions frequently.

to behave in their characteristic domineering manner. We could see at close range the kinds of food the old birds brought; we learned (with patience) how long the youngsters had to wait between meals; and we were able to record with the speed flash the home life of these interesting predatory birds.

Two Birds a Day per Youngster

The youngsters apparently never suffered from hunger, because there always was unused food on the nest whenever we arrived. They grew normally, and the last of the three left home when it was 31 days old.

Observations were made on 11 days, during which I spent 30 hours in the blind, Paul Shepard 19, and Brina Kessel 9, at various times between 6:30 in the morning and 7:30 in the evening.

During the 58 hours that they were under observation, the young hawks were fed 28 times on ten species of birds or small mammals, including one meadow mouse, two chipmunks, eight robins, five house sparrows, two starlings, four flickers, two meadowlarks, two young red-eyed vireos, one young song sparrow, and part of one white leghorn pullet.

This was at the rate of a little more than two birds a day per youngster.

The old birds apparently were not alarmed

Father Robin in Blinders Shows the Opaque, Lifeless Eye of a Statue

Here the nictitating membrane is fully extended. Other birds use such a shield; so do most reptiles and many mammals, including dogs and cats. In man the organ is vestigial. The robin touches the back of his nestling's tongue with the worm to start throat muscles working; otherwise the dinner might crawl out.

by the flash, although they became alert and departed at any movement made in the blind, such as that of changing plateholders.

Altogether, the experiment proved successful, and in the resulting photographs others can now view incidents in the home life of a hawk without the inconvenience it caused us, and, incidentally, without the same degree of excitement or satisfaction.

"Tooth to Nail" with a Chickadee

We next turned our attention to a bird which is the antithesis of a Cooper's hawk—a friendly little chickadee with no allergies to people or to cameras.

"Don't close your eyes, Dolly," I admonished my daughter as we tried for photographs of the chickadee flying to her lips to take a peanut from her teeth.

The first series of pictures we had made were ruined by tightly closed eyes, though neither of us had noticed, at the time, that no matter how interested Dolly was in having a friendly little bird perch on her chin, she unconsciously closed her eyes when she saw it approaching her face.

The camera had caught all the eagerness and anticipation on the face of the chickadee, but Dolly had reacted in a most natural, but nonphotogenic, manner.

So this time I constantly reminded Dolly to keep her eyes open. With conscious effort she partially did so, giving added charm to the photograph of a truly wonderful experience —that of meeting a wild creature face to face (or tooth to nail, as Dolly puts it) with a natural expression of confidence (Plate XI).

An ordinary robin provided a real test of the new speed flash for a study of wing and feather action in flight. The bird had very considerately accepted for its nest site a movable shelf we had fastened to the laboratory window casing.

When the young were well grown, we lowered the shelf to a convenient height from the floor, fastened a blue backdrop behind the nest so that the photographs would not appear as if made at midnight, and set the sealed-beam flash tubes at the right heights and angle inside the laboratory.

Color film is so slow that the lens diaphragm must be set at F5.6, even with the lights two feet from the subject; so there is very little depth of focus. Indeed, one cannot get wings and body equally in focus except when the wings are held straight back (Plate XII).

Black-and-white film, however, provides sufficient speed to use a stop of F.22, and the resulting series of clear pictures of the wings in their different positions gives one a new notion of the flexibility of the feathers.

Wing a Wondrous Mechanism

There is the upstroke, for example, when not only is the wrist joint bent so that the wing as a whole offers the least resistance to the air, but the individual primaries and secondaries are all turned on edge, so that the wing opens up like a Venetian blind (page 775). One sees the robin's body right through the wing, and the wing is lifted with practically no air resistance.

On the downstroke, however, the flight feathers are beautifully imbricated, or overlapped, to give the greatest possible resistance to the air (page 772).

In photographs of the robin about to alight, we see the group of feathers borne on the thumb, and known as the alula, standing out at almost right angles to the wing. The tiny rudimentary first primary, which is found in all thrushes and for which no one has ever advanced any satisfactory explanation, likewise stands out from the rest of the wing (page 773 and Plate XII).

Can it be, as my colleague, Dr. Paul Kellogg, suggests, that these feathers, acting in conjunction, serve like the spoilers on the front edge of the wing of a plane, to break up the smooth flow of the air and destroy its lifting power? This would allow the bird to alight more accurately.

The number and relative lengths of the flight feathers in different individuals of the same species of birds are always the same, as are the actual lengths also, to within a few millimeters. Indeed, all the species in a bird family, such as the thrushes (Turdidae), which include the robin, show remarkably little variation.

In the robin photographs, for example, one sees a tiny first primary followed by four long primaries of about equal length, followed in turn by five gradually shortening primaries and six secondaries, giving the appearance of a more or less square-ended wing.

If one were to examine the wing of a wood thrush or a bluebird, or any one of the 304 species of birds found all over the world that make up the thrush family, he would find the same rudimentary primary, the same four long primaries, etc., making up the same shaped wing. There would be few exceptions.

On the other hand, if one examined any one of the 63 wrens that make up the family Troglodytidae, one would find, as in the photograph on page 788, a wing in which the primaries gradually lengthen from the first to the fifth and then shorten again as the body is approached, giving the appearance of a rounded wing.

Similarly, in all the swallow family, the Hirundinidae (page 790), the first primary is the longest, and the flight feathers shorten very abruptly toward the body, giving what is called a pointed wing.

The number of functional primaries (those borne on the modified hand) of an ordinary bird is always ten, except in a relatively few families of perching birds, where the number is nine. The number of secondaries (those borne on the forearm), however, varies considerably in different families of birds, from the six (plus two tertiaries) of the thrushes to as many as 37 in the excessively long-winged albatrosses.

Indeed, length of the wing in birds is usually gained by increasing the length of the forearm with its secondaries, rather than increasing the number or relative lengths of the primary feathers.

Birds in Flight Identified by Wings

The different shapes of the wings of a number of small birds are shown in the accompanying photographs, and one familiar with birds in flight can often identify their silhouettes against the sky by characteristic wing action and resulting steadiness or undulations in the course of flight.

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Ektachrome by Arthur A. Allen

A High-speed Flash, Clarifying a Whirling Blur, Reveals What the Eye Never Sees

Using 1/5000th part of a second, Dr. Arthur A. Allen, Cornell ornithologist, took this and succeeding pictures with electric-flash apparatus. By freezing motion in mid-air, he proved flight techniques which he had only suspected. This male cardinal unlimbers landing gear on approaching a feeding station in Ithaca, New York. Feathers of the rounded wing, which here start the downward stroke, are nicely overlapped to catch the maximum air.

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X

Kodachrome by Arthur A. Allen

Speed Lighting Shows How a Falconer's Sparrow Hawk Stretches Legs and Talons to the Utmost for a Finger Landing

Always rewarded with a small steak, the bird learns to fly to hand when it hears its master's whistle, sometimes from the distance of a quarter mile.

Face to Face with a Chickadee

For bait, the author's daughter, Dolly Allen, holds a peanut in her teeth. Of the two, the bird performed more easily. When the chickadee darted toward her chin, Dolly blinked, spoiling a series of photographs.

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A Flash Through the Window

These evening grosbeaks were tricked into posing by sunflower seeds sprinkled on a window ledge. Summertime Canadians as a rule, they winter in the United States, wandering as far south as Washington, D. C.

Ektachromes by Arthur A. Allen

Father Robin Spreads Wing Feathers Like the Ribs of a Fan

Here the speed flash exposes a tiny, rudimentary primary feather and the ear-shaped alula, or false wing, seen just back of the head. These feathers, standing almost at a right angle to the wing at the instant of the flash, are borne on the thumb of the bird's modified hand.

Ornithologists have not been able to agree on Nature's reason for providing the alula. Analysis at 1/5000th part of a second suggests that this process, acting like the spoiler of an airplane wing, shatters the air's smooth flow in the interest of a shorter, more accurate landing.

This cheery breadwinner, caught with an earthworm in his beak, considerately nested on a window shelf, where he made his brood a perfect camera target.

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Ektachrome by Arthur A. Allen

In Green-eyed Rage a Cardinal Fights His Fancied Rival

Cardinals brook no competition from other males in the territories which they select for their nests.

While flying through a garden, this bright fellow saw his reflection in a windowpane and convinced himself that he had spotted an interloper. Using beak, claws, and wings, he gave the "stranger" a good going over. When a mirror was placed on the window sill, the bird transferred his attentions. Undiscouraged by his failure to achieve more than a draw, he continued the battle for weeks.

Like other birds, the cardinal has no idea of the meaning of glass. In time of danger he may fly head on into a closed window.

Frequently nesting in the vines of a back porch, he performs in many lovable ways for the entertainment of his hosts.

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Ektachrome by Arthur A. Allen

Speed Lighting "Mounts" Hawks More Faithfully than Taxidermy

Cooper's hawk, commonly called chicken hawk, and not without reason, regularly feeds on small birds.

This fierce but doting parent, acting according to instinct, has decapitated its prey, a starling, and plucked most of the feathers.

An orange-colored eye is a sign of the bird's immaturity; in time it will be ruby red. The youngsters have bluish eyes. They are very hungry, having waited for three hours (as did the photographer!).

To obtain the picture, the author and one of his students spotted the birds' lodging high in a tree. They rigged this dummy nest below it and transferred the fledglings. Their deception succeeding, they lowered the nest ten feet a day until it was at camera level. Then they photographed the blissful home-coming from the privacy of a blind.

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Ektachrome by Arthur A. Allen

Red-tailed Hawk Pounces on Master's Gauntlet for a Meaty Reward

Falconry, like archery, goes far back into antiquity. Chinese appear to have practiced hawking 2,000 years ago. Ancient sculptures attest the sport's favor in Egypt and Persia. Greeks and Romans left written accounts. In medieval Europe falconry became a favorite pastime of the nobility.

Though gunpowder brought about its decay, the sport never died out. Today it is gaining favor among young Americans. Central Asians still train the golden eagle to hunt foxes.

Usually the hawker obtains his birds by taking nestlings or trapping adults. With hoods, lures, whistles, and gentleness he trains them until they become accustomed to man and his dogs. Many show affection toward their owners.

Though it makes an interesting pet, the red-tailed hawk is too clumsy in the air to be an accomplished hunter like the peregrine falcon. Owing to an undeserved reputation as a chicken thief, it has been relentlessly persecuted. Actually, it deserves protection as the assassin of mice, rats, gophers, snakes, and other vermin.

Leather thongs, known as jesses, are worn by this bird for tethering to its perch.

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Kodachrome by Arthur A. Allen

XVI **Red Mouths Gape for May Flies Brought Home by "Old Man" Canada Warbler**

Not a sunbeam penetrates the Adirondack forest, but the speed flash lights the gloom like day.

© National Geographic Society

Ektachromes by Arthur A. Allen

Which Child Is Hers? Scarlet Tanager Doesn't Realize She Has Two Imposters

A parasitic cowbird, unwilling to raise her brood, sneaked two eggs into the nest. Already her greedy offspring have kicked out one foster brother. Young tanager (middle) has a yellow mouth lining; the foundlings, pink.

It would take many photographs, however, and a careful study of the use of the different feathers to work out the correlation between wing shape and wing use, as practiced by different species.

Of course, certain relationships are obvious, such as the long, narrow wing of gulls for gliding, the broad, rounded wing of buzzards for soaring, and the short, rounded wing of grouse for quick bursts of speed. The numerous minor variations, some of which are manifest in the accompanying photographs, will require much study before they are fully understood.

Speed Flash Quicker than a Wink

Another action which is too quick for the human eye, but which is recorded by the speed flash, is the movement of the bird's inner eyelid, or nictitating membrane, as it is called. This translucent membrane flicks across the eyeball to remove dust or to give protection to the cornea when necessary.

When a robin feeds its young, the membrane naturally draws across the eye to keep out the bill of the youngster or to keep the sand on the worms from lodging where it should not.

An examination of the accompanying photographs of the robin shows the eyelid halfway across the eye when the birds' feet touch the nest (page 776) and completely across it during the act of feeding (page 777). The young bird's eye is protected in the same way.

The position of birds' feet in flight and upon landing has always given naturalists cause for conjecture and argument, and taxidermists and bird artists are frequently in disagreement. The tremendous forward swing or extension of the legs of hawks and falcons upon alighting or pouncing on their prey is seldom credited or shown with accuracy in paintings or in habitat groups of mounted birds.

Two of our Cornell students, Heinz Meng and Steve Collins, have been training hawks, and this gave us an opportunity to record leg action as well as wing action when the birds pounced upon dead mice or returned to their owners' fists (Plates X and XV).

It is remarkable how obedient these birds become when properly handled, celebrated though they are for their wildness.* Captured when fully adult, and knowing only the fear of man and the ferocity of killing its prey in mid-air, a peregrine falcon, after a few months of training, becomes gentle and flies to its trainer's hand at the proper whistle.

Tossed into the air, given his liberty to go where he pleases, he waits on the pleasure of his trainer and circles about until the whirling lure tells him there may be food at his owner's feet, if he strikes the imitation bird from the air.

In striking as in alighting, the hawks extend their legs to the utmost, so that the weight of their bodies in bending the tibiotarsal joint will drive the sharp claws into the victim or about the perch where the hawk alights. With the larger hawks the trainer must wear a heavy glove.

The accompanying photographs of the hawks do not show where the feet are carried during normal flight, but with binoculars they are easily seen under the tail as the birds circle overhead.

The long legs of herons and cranes trail out behind and are easily seen at a distance, but how does a small bird hold its feet in flight? Most of the accompanying photographs are of birds about to alight when the legs are being let down like landing gear. The house wren, however, still has his feet tightly pressed against his breast (page 788), and the others are apparently dropping their legs from a similar position rather than from beneath their tails.

The ridiculous posture of the sora rail (page 789) is due to the fact that when rails take off on their weak wings they continue to claw the air with their long toes as if they were still running over the mud flat, and it is only when they get well under way that their legs trail out behind like a heron's.

At First, Camera Caught Only Tails

Wing shooting with a shotgun, whether at quail, grouse, ducks, or clay pigeons, is usually not very successful for the tyro. It takes years of experience before one can confidently place a three-foot circle of shot on the exact spot where the flying target is expected to be at a somewhat uncertain fraction of a second later, depending on the distance, the speed, the wind, etc.

And so, likewise, with the high-speed flash of flying birds, if one waits until the bird is at the desired spot before pressing the release, one will photograph a blank every time, or at best get only the bird's tail on the film.

The first time any of us used the apparatus with which the accompanying photographs were made, we focused on a spot that chickadees and nuthatches were expected to pass in coming to a feeding station. They passed the spot all right, but so rapidly that out of 12 shots fired by three of us, the resulting bag of bird photographs was three chickadee tails.

* See, by Frank and John Craighead, in the National Geographic Magazine, "Life with an Indian Prince," February, 1942, and "Adventures with Birds of Prey," July, 1937.

No Welcome Mat! A House Wren's Door Bristles with Spines to Discourage Visitors

To feed seven youngsters, the pair made an astonishing number of trips daily; yet the male still found time to sing. Other busy male wrens have been known to run two households at once. Here the speed flash lights up the wren's rounded wing and the foot's flight position (page 787). Cargo is a caterpillar.

In Silent Appeal, Not Raucous Shout, These Blue Jay Babies "Open Wide"

Footloose blue jays are the very synonym of noisy chatter; yet this family carried on so quietly that its presence in the spruce next to the door almost escaped the author. There is plenty of action but no sound in this high-speed shot, which "froze" the parent's wing action at the moment of landing.

Banded and Released, a Sora Rail "Runs" Through the Air as He Would on Land

In spite of their weak wings and awkward-appearing take-off technique, some soras cross the Caribbean, to winter in Venezuela and Peru. In the Atlantic States the rails are considered game birds. Each fall they run a hunters' gantlet in the tidal marshes.

The photographer has to learn from experience his personal delay in reaction from the moment he says to himself, "Shoot," until the message is conveyed to his finger tips with the resulting flash, and he has to estimate how far the bird will travel during that delay.

Of course, there are no cripples if he does not center his birds, but there is considerable disappointment and loss of face when an otherwise perfect photograph comes out of the developer showing only the tail of a bird.

Naturally, the operator has no control over the position of the wings of the bird he is photographing and many a dud results, even when he becomes expert at centering the bird, because the wings are far forward, concealing the bird's head, or in some other awkward position.

Practice Shots at Feeding Station

We began our practice shots with the high-speed flash at a feeding station for birds, where their comings and goings could be somewhat regulated, for it is necessary to have the apparatus set up in advance, with lens and lights trained on a definite square foot of space where the action is to take place. In addition, the action has to occur on a very narrow stage, for the depth of focus is only a few inches.

Therefore, I trained the birds to feed in front of our blind on a shelf about six inches long and two inches wide, and I placed a convenient perch about two feet from the shelf on which the birds were expected to alight before flying to the feed.

I knew they would then traverse a definite path; I would have plenty of warning and could concentrate upon centering the bird on the film.

Eighteen inches, I discovered, was my delay in reaction, so that I had to push the shutter release the moment the bird left the prepared perch if I wished to catch him in the center of my film, which was focused on the square foot 12 inches distant.

Red squirrels and chipmunks do not move as quickly as birds, I discovered, for when I made the same allowance for them, as they jumped from the perch to the food shelf, they had barely reached the film when the flash recorded their jump.

Even after all these preparations, I sometimes photographed the blank blue background which I had set up behind the food shelf to avoid the blackness of most flash-

A Barn Swallow, Preferring Man's Abodes, Strikes a Phone Wire with a Wingtip

In summer, barn swallows are found from Alaska to Mexico. Winter sees some migrating as far as Argentina. Having adopted man's buildings as their own, they have become subjects of fanciful tales. Contrary to legend, they do not hibernate in the mire on pond bottoms, but they do build nests of mud (right).

bulb pictures. The reason for this was that the birds occasionally changed their minds after leaving the perch and flew to the ground or to the top of the set—and, after all, I was no mind reader.

Particularly was this true of the little chickadees, which became allergic to the flash after a few experiences. Even though they could see no motion or other indication of my intentions in the blind, they would change their course in mid-air and flit in some other direction just before the flash consummated my delayed reaction.

It was a good setup, however—like shooting skeet in preparation for the duck season—and resulted in many interesting photographs of wings in action.

Arguments over "Peck Order"

Sometimes arguments occurred among the birds on the shelf as they endeavored to establish a "peck order." It was not often that the action of both birds took place in the plane of focus, but occasionally a lucky shot resulted, such as one of a redpoll trying to land while another throws up one wing and points his bill at the newcomer in an effort to intimidate him. In most of the photographs at least one of the quarreling birds proved to be out of focus.

Luxembourg, Survivor of Invasions

By Sydney Clark

With Illustrations from Photographs by Maynard Owen Williams

LUXEMBOURG has been surviving invasions for more than a thousand years, but America's part in her latest and most arduous survival—from the Battle of the Bulge in 1944-45—was directly responsible for my own survival as a postwar pleasure traveler in the Grand Duchy.

Some twenty months after Field Marshal Karl Rudolf Gerd von Rundstedt's attack and repulse, I entered the city of Luxembourg, the capital, and at the nearest hotel nonchalantly asked for a room.

"Sorry, sir," said the clerk, in good English. "We've had to turn away over 200 people today. We have nothing at all."

Thinking the place might be especially in demand because it was a good hotel directly opposite the station, I tried another, then another, and then ten others in swift succession, becoming very unfussy indeed.

Vacationists Tax Luxembourg Hospitality

There were almost no American or British travelers in evidence, and scarcely any French, for their own Government's severe currency restrictions prevented them from touring outside of France; but it seems that I had reckoned without the Belgians. As visitors they can enter Luxembourg without passport or visa, and their francs are interchangeable at par with those of the smaller country.

All Luxembourg is holiday terrain to tens of thousands of Belgians, and their number that day was much above normal, since this was the week end of July 21, Belgium's national holiday.

It was late afternoon, and still another hotel manager was giving me his polite regrets, when a timid girl of about 14 appeared and told him her mother had a room. She would take two ladies or a man and wife, provided they would stay at least a week.

The manager turned brightly to me and asked if I would pay as if for two.

"Of course," I said eagerly, but the girl, a literalist, interposed firmly: "No. Mamma said it must be two people, and they must stay a week."

"Go along with her, anyway," said the manager. "You can talk her mother into it. Don't let the girl out of your sight."

It was a good half mile to her home, and during the walk we talked in French. As I answered the youngster's questions about Hollywood, she melted utterly and became my friend and champion. When I saw her mother, I knew that I had need of a champion.

"No, Kathy," said the dour lady very sharply in the Luxembourg patois, which my knowledge of German enabled me to grasp. "No. I told you to get two ladies or a man and his wife."

"But, Mamma, he . . ."

I interrupted and explained in German that I was an American writer come to see where my countrymen had fought in Luxembourg.

"Your Soldiers Saved My Country"

"Ein Amerikaner! Doch! And are you a friend, perhaps, of the great General Pat-ton who died and who is buried at Hamm near here?"

"I met him," I replied, making what I could of a very minor contact.

"But that doesn't matter," she said, and her whole manner had changed to one of eager hospitality. "You are an American. Your soldiers saved my country. More than 8,000 of them lie at Hamm. Come in, come in. I will show you your room."

I presently went out to see the city and to dine, and when I returned at 10 o'clock I found mother and daughter leaning out of a window to watch for me.

"Do they have chocolate in America?" called the girl.

"Yes, Kathy. We have chocolate, and gum, and tall buildings, and big cities."

"Which one do you live in?" she asked as I came into the house.

"Boston."

"And is that near New York?"

"About 300 kilometers."

She thought I said *meters* and fairly squealed. "Three hundred meters! My, that's pretty near! I'd like to live that near to New York."

"Go to bed, Kathy," called her father from another room. "Let the gentleman rest."

"Yes, Papa." But she didn't go. Her mother asked if I should like to have her wake me in the morning, but I said I had an alarm clock. Kathy pleaded to see how it worked, so I showed her.

"Tell me about the tall buildings, sir," she said irrelevantly.

"Go to bed, Kathy," from the other room.

"Yes, Papa."

A Flower-vending Countrywoman Finds Business Brisk in a Luxembourg City Square

Her eye-appealing display attracts market-day shoppers in the capital's Place Guillaume. The square and its equestrian statue honor William II, 19th-century Netherlands king and Grand Duke of Luxembourg. In the background rise the slender spires of the Cathedral of Notre Dame. The Grand Duchy and its capital share the same name. War passed the city by, although the Germans fired a few projectiles into it during the Battle of the Bulge. One struck and damaged a spire of the Cathedral.

She took my two hands and clung to them. "Is Holly Vood very pretty, sir? Do you know Bing Cros-bee? What was General Pat-ton like when you met him?"

"*Kathy, go to bed!*" The voice was thunderous.

The girl was suddenly scared, and very flustered, too. She loosened her belt and started to pull her dress over her head, but still she didn't leave. Her mother convoyed her to the kitchen, where she was to sleep on a cot, but once more she darted back and seized both my hands. Her eyes glistened. She brought out no more words but pressed my hands hard, and fled.

It was to me a moving experience. I, so recently a vagrant in Luxembourg, with no roof over my head, had been metamorphosed into an angel, a being apart, *the man from America.*

In more conventional and restrained forms I encountered similar reactions from many persons in many parts of the Grand Duchy. Despite the terrible destruction wrought by our airmen and ground forces in blasting Von Rundstedt's offensive and in driving his forces back into Germany (60,000 persons were made homeless, a fifth of the population), America is devotedly loved by Luxembourgers, high and low.

I took a bus to Hamm one day and walked a mile through the woods to reach the American cemetery. The exact number of white crosses and stars of David there was 8,412,

Sons and Daughters of the Royal Family Honor Their Father on His Birthday

Led by uniformed Prince Jean, hereditary Grand Duke, they walk to special services in the capital's historic St. Michael's church. Traditionally, the one for whom such a service is held is absent. Here Prince Jean represents his father, Prince Felix of Bourbon-Parma, consort of Grand Duchess Charlotte, constitutional ruler of Luxembourg. Father and son served in the British Army during the war.

and it must wrench the toughest heart to see them in their endless even rows.

At the time of my visit, General Patton's cross was Number 222 in Plot EE, Row 9, and it was exactly like the others except that it bore four stars. Number 220 was for Wayne A. Dexter, Number 221 for John B. Przywara. Numbers 223 and 224 were for A. F. Spellman and J. M. Opyrchal. Near by were graves marked Unknown. So George S. Patton, Jr., as dramatic and effective a leader of men as the war produced, lay in the midst of his combat soldiers, some "known only to God."

Later, General Patton's grave was moved so that the crowds it attracted would not trample on other graves (page 798).

The General was buried December 24, 1945, almost exactly a year after he launched his great effort northward into Luxembourg from France. It was his hard fate to die of an automobile accident rather than in battle, but he is no whit less revered for that. He has become somewhat of a patron saint to Luxembourg.

Smaller than Rhode Island

The area of the Grand Duchy is 999 square miles, as if the country had been sternly bidden by 19th-century treaty makers, who drew its boundaries, to "keep under a thousand" (map, page 794).

Thus Luxembourg is little more than four-fifths the size of Rhode Island. Its total population of approximately 300,000 is about the same size as that of the city of St. Paul,

Drawn by H. E. Eastwood and Irvin E. Alleman

Thrice German Troops Attacked Through Peaceful Luxembourg

Surprise thrusts into France and Belgium violated her territory in 1914, 1940, and 1944. For centuries the Grand Duchy has survived wars, invasions, and peace conferences. On March 17, 1948, the Benelux nations (Belgium, the Netherlands, and Luxembourg) joined Great Britain and France in a 50-year pact of mutual assistance and economic cooperation. Inset map places Luxembourg in this western European union; its dark-gray area shows the extent of the Von Rundstedt offensive of December, 1944.

Minnesota. Its army before World War II mustered about 250 men.

Placed by fate in a perennial path of invasion, little Luxembourg has had to weather successive gales of war. If her aggregate forces have been of minuscule proportions, her spirit has been strong; and it has always been fueled by a passionate insistence on her own integrity as a free nation. With the physical power of a babe in a whirlpool, she has fought like an athlete, using ingenuity as muscle.

To see ample evidence of this, we need not go further back than the period when Germany developed her habit of bad faith and aggression.

In 1866 the German Confederation, of which Luxembourg had been a member, fell to pieces, and the various neighbor nations of the Grand Duchy shortly gave her "parchment bulwarks" by guaranteeing her neutrality and later her absolute inviolability. In 1867 the strong fortress of the city of Luxembourg, which had been garrisoned by Prussian troops, was ordered dismantled.

Germany signed a pledge that Luxembourg's railways would never be used for war purposes. But infinity had no meaning for the Kaiser's forces, and on July 31, 1914, they seized the Luxembourg border station of Troisvierges. Two days later armored trains from the Reich, with troops and ammunition, were rolling at will through the Grand Duchy, whose violent protests were swept aside.

A fraudulent notice, previously printed at Koblenz and held in readiness, proclaimed to the people that despite "all the most strenuous efforts of His Majesty, the Emperor of Germany, to preserve peace," France had violated Luxembourg and attacked Germany from its soil, so no other course was open than to counter these attacks.

The short, ugly word for this false document was spoken, in obvious implication, by Chancellor von Bethmann-Hollweg himself, who stated on August 4:

"We have been obliged to ignore the just protests of Luxembourg.

"The injustice, I speak frankly, the injustice

that we are committing we will endeavor to make good as soon as our military aims have been attained."

Of course, if Germany had actually been attacked by France from Luxembourg soil there was no injustice. The Koblenz proclamation and the German Chancellor simply did not tell the same story.

In sober fact, France had withdrawn her troops for a depth of ten kilometers on her side of the Luxembourg border and forbidden her troops to go beyond that point, lest "incidents" occur.

Luxembourgers Chose Cause of Freedom

The Luxembourgers immediately gave their support, almost to a man, to the Allied cause. Thousands of men, having no army of their own, since their country was legally neutral, fled to France and enlisted in the French Army. Of the 3,200 Luxembourgers who fought in the Allied ranks in that war, 2,800 lost their lives.

Grand Duchess Marie Adelaide abdicated the throne in 1919 and retired to a Carmelite convent in Modena, Italy. She died in 1924 at a family castle in Bavaria at the age of 30.

Her younger sister Charlotte succeeded her and is still the reigning sovereign. In World War II she behaved with as much insight and courage as Queen Wilhelmina of the Netherlands, fighting her nation's cause from free foreign soil. She is warmly beloved, as many a Luxembourger has recently testified to me.

As the German aggression of 1939 rumbled into action, there again was Luxembourg directly in the Reich's path of conquest.

In this connection one recalls President Roosevelt's personal appeal to Hitler on April 15, 1939, requesting a pledge that he would not invade 31 specifically named countries, of which Luxembourg was one.

Hitler chose to consider it a very funny document. He read it aloud to an appreciative Reichstag, which roared with laughter at the Leader's jaunty humor. I heard it all over the radio from a Paris café and I well remember my special inner rage as Hitler read the name of Luxembourg in the list. He was in high fettle. A very funny paper this, from Warmonger Roosevelt!

After war broke out, and as late as May 9, 1940, the Nazi Government declared, "Germany does not intend to impair the integrity and independence of the Grand Duchy either now or in the future."

Manfully He Plays in the Band at Vianden's Nut Festival

Dominated by its medieval castle, Vianden stands on the banks of the frontier Our River in northeast Luxembourg. Parts of the castle, with its early Gothic banquet hall capable of seating 500 knights, date from the 13th century. Each October the town holds a festival when the English-walnut market opens.

Plowed Fields, Forests, and Trim Towns Make a Peaceful Pattern in War-torn Luxembourg
This unscathed countryside is near the historic capital city of Luxembourg in the Grand Duchy's southern agricultural section.

Air Transport Command, Official

It Contrasts Abruptly with Scenes in the Path of the Savage Battle of the Bulge

The last German offensive, in December, 1944, which Luxembourgers call "the Rundstedt Thing" (page 799), devastated the country's northern half.

General Patton Lies in the Luxembourg Soil He Liberated

Except for its gold stars, his plain cross, with "name, rank, and serial number," plus the name of his dashing Third Army, is a duplicate of thousands which stand in endless even rows in the U. S. Military Cemetery at Hamm, near the capital. Buried first in GI ranks, the general was moved front and center to spare near-by graves the trampling feet of crowds of pilgrims. To Luxembourg, Patton is the war's greatest hero (page 793).

The next day her armies rolled in. A particularly revolting Gauleiter was installed. The Chamber of Deputies and Council of State were dissolved. The Gestapo, with its foul tradition of persecution and outrage, blossomed overnight and instituted a reign of terror.

The French language, officially used in Luxembourg for some 800 years, was forbidden, and persons with French names were forced to adopt German ones. Avenue de la Liberté in the capital was changed to Adolf Hitlerstrasse. Hitler schools were established everywhere, including one in the famous Abbey of Clervaux, a desecration which cut pious Luxembourgers to the quick (page 801).

Luxembourg's reaction was instantaneous and sustained. She abandoned her long-kept neutrality, and the court and some important members of the Government fled to England and Canada. These included the Prime Minister, Pierre Dupong, who is still the Prime Minister and Minister of Finance in the politically stable Grand Duchy.

The Resistance groups of Luxembourg were strong, subtle, a constant thorn in the con-

queror's side. Germany made Luxembourg an integral part of the Greater Reich and impressed all men of military age into the German Army, but a member of the Government told me that 60 percent of the men mysteriously "disappeared." They turned up later in the Allied armies or remained under cover, working secretly with the Free French underground forces.

In spite of this, the Nazis were able to round up several thousand young men between 18 and 24 and sent them to the Russian front. Up to date, more than 2,000 Luxembourg young men are missing, in addition to the number established as killed in battle.

The Germans looted most of the homes of patriots who were in exile or whom they had deported or imprisoned. Thirty thousand Luxembourgers were forcibly deported from the country.

When the war finally turned against Germany, her forces were driven out of Luxembourg, in September, 1944. A wave of infinite relief came to the Grand Duchy. By a veritable miracle she had escaped destruction.

"The Rundstedt Thing"

But then came the awful anticlimax, the December Battle of the Bulge, which local folk bitterly call "the Rundstedt Thing." That "hangover" of war's harsh fury did what the earlier incursions had not done. Though it mercifully missed the capital by a narrow margin, except for a few projectiles, the fighting literally laid waste all the northern part of Luxembourg; it spread over to the Belgian Ardennes and ruined that section, too.

The traveler may easily cross the border from Wiltz to Bastogne and visit the wreckage of Bastogne. It is a macabre spectacle, but the Belgian town is enormously proud and grateful, despite its ruin, for the stand made there by the Americans.*

It seems to me a wonderful evidence of recuperative power that so soon after this holocaust the Belgian Ardennes and Luxembourg became again regions of high holiday.

Even Echternach, the most battered town in all Luxembourg, I found awash with tourists, hundreds of them Luxembourgers, and it was the same in ravaged Vianden and Clervaux. Every possible hotel that could make a few of its rooms habitable did so and filled them promptly with lighthearted vacationists.

The fact that the capital escaped with slight damage is a boon to all visitors, as well as to the Grand Duchy, for to me there is no more strikingly situated city in Europe. It perches on a rock base shaped like a curving and decorative M, the strokes of the letter being the dizzily deep valleys of two small streams called the Pétrusse and the Alzette.

The base of the M is a glorious semicircle of bosky park where once stood thick walls, for this city was formerly an "inland Gibraltar," one of the strongest fortresses on the Continent. Because the fortress was dismantled in favor of the parchment ramparts earlier mentioned, after the Treaty of London in 1867, the city now bristles with steeples rather than guns. But the old casemates, with their miles of underground galleries, are one of its greatest attractions.

From the lofty bastions above the river valley the scene is startling in its grandeur. Best are the views from the Boulevard Franklin D. Roosevelt and from a point, with porcelain orientation disk, where two streets called Cornice Way and Adam's Rib (Chemin de la Corniche and Côte d'Adam) meet high above a hairpin curve in the Alzette.

The grand ducal palace, which the Nazis used as a tavern, is near this point and worth seeing as a study in royal simplicity. Were it not for the alert military guards at the entrance, one would think it merely a fine private residence, one of many in the city.

Radio-Luxembourg, located in the capital, is one of Europe's most influential broadcasting stations.

Another sight, of much more urgency to the average traveler, is an advertising sign filling the sky of a side street near the palace with metal letters by day, neon glow by night, and gastronomical allure at all times. It says simply STUFF, and that is precisely what one does upon entering the establishment.

"Stuff" is the name of one of the most appealing restaurants in Europe. I found its fare and everything about it exactly the same as when I first discovered the place (and obeyed its gleaming command) in 1929.

A Paradise for the Palate

For some reason hard for the visitor to grasp, Luxembourg, even after its latest and hardest survival of invasion, very quickly recovered its capacity to provide good, ample food and to cook and serve it well. To my delight I found that a foreign partaker of it need not cope with ration tickets, as in most lands, or even pay extra for the lack of them, as in Belgium. In every Luxembourg restaurant, I, as a foreigner, was asked merely to sign a food register and record my nationality and permanent residence.

"How does Luxembourg do it?" I asked myself and then others. The best answer I could

* See "Belgium Comes Back," by Harvey Klemmer, NATIONAL GEOGRAPHIC MAGAZINE, May, 1948.

Only a Placid Mirror of Water, Meandering Between Vine-clad Hills, Separates Germany from Little Luxembourg

Flowing northward from France, the Moselle forms Luxembourg's southeast boundary with Germany. In this view down the river, the Grand Duchy is on the left. The wine town of Wormeldange faces German Wincheringen (right).

Nazi Desecration Ruined Clervaux's Abbey (Upper Left); Bitter Fighting Wrecked Its Old Château (Right), Opposite Parish Church

In Battered Echternach a Gothic Arch Frames War's Destruction and Youth's Blithe Spirit

Southern anchor of the Bulge, Echternach is Luxembourg's most war-damaged town. Though a tragic wreck, it welcomes holiday seekers to pleasure spots on the Sûre River. On Whit-Tuesday, pilgrims and townspeople dance to honor St. Willibrord, a 7th-century English missionary who founded an abbey in Echternach.

get was that the Nazis, considering Luxembourg a part of Germany, did not loot it thoroughly while they could and had no time to do so when they were being ejected.

However, the Germans did loot it considerably, and I fell back on the belief that this bucolic land is especially favored by Nature and that its people have always considered good eating a matter of special importance.

The Stuff proved an excellent place in which to examine the language of Luxembourg. On one of its beams was a gay quatrain which may be freely translated thus:

Two cats and one mouse,
Two women in one house,
Two dogs with one bone,
Quarrels come and peace
has flown.

The words for "cats," "mouse," and "house" —*Katzen, Maus,* and *Haus*—were all exactly the same as in German.

A patron of Stuff, noting my interest, addressed me in French and with a curious belligerence:

"The popular language here is nothing like German, monsieur, though it might seem so to you. It comes straight from Holland Dutch. Germans can't understand us Luxembourgers when we speak the national language."

I politely agreed with all he said, but the language of the Grand Duchy still looked and "listened" to me very much like German. I surveyed an advertisement on the Stuff menu, stating that a certain brand of cigars was *bekannt als de' bescht am ganze Land* (known as the best in all the land).

I took out my wallet and studied my Luxembourg paper money of the denominations of five, twenty, and fifty francs, marked *Fennef Frang, Zwanzeg Frang, Fofzeg Frang.* Each bill bore also the country's native name, which is Letzeburg (from Lützelburg—"Little Fortress"), as well as the Frenchified "Luxembourg."

I thought of the freedom cry of Luxembourg carved on a stone pillar in the Place d'Armes: *Mir Wœlle Bleiwe Wat Mir Sin* (meaning "We wish to remain what we are") and mentally compared it with the German *Wir Wollen Bleiben Was Wir Sind.*

It did certainly "seem so" to me, but I remained on a plane of politeness with my self-appointed informant. It seemed to me significant that he felt shame and anger that a

A Biblical Precedent Guided Potato Growers at Digging Time

Like Boaz in dealing with Ruth, many "let fall some of the handfuls of purpose" so those who were war-poor but proud might not want (page 804). With state help potato growing has developed rapidly in Luxembourg's ravaged northern parts. In 1946 the Grand Duchy exported nearly 7,000 tons, but yield in dry 1947 was poor.

foreigner might consider his language similar to that of the detested Reich. I decided then that it would take a hundred years of patient effort for Germany to win the friendship of the little land which she has so cruelly and repeatedly violated.

A Land of Linguists

Most of the people of Luxembourg speak French (the official international language of their country) as well as German and their own idiom. Many also speak English, learned in school.

An American officer in Luxembourg during the war encountered a rosy-cheeked little boy being drawn on a sled by his mother. When the boy smiled a greeting, the officer said, "Bonjour," whereupon to his surprise the lad exclaimed to his mother in perfect English, "Why, he is French!"

In the local newspapers three different languages may appear on the same page. One article may be in German, one in French, and another in the Luxembourg idiom. For the benefit of Americans during the Battle of the Bulge, English was added to this potpourri.

Religion, government, and steel are the three foundation pillars of the Grand Duchy, and all are interestingly represented in the capital.

Religion I place first, because its power over the people is tremendous. This is a Roman Catholic land of intense, old-school piety.

For two weeks during the month of May almost the entire population of the country makes a pilgrimage to the capital to worship "Our Lady of Luxembourg, Consolatrix Afflictorum," the patroness saint of the Grand Duchy for 350 years.

At Sunday masses in the capital's cathedral, a packed congregation comes thundering in with its responses in such prodigious volume and such unison that one can have no doubt of the Church's hold on the rank and file.

The Cathedral has a special treasure—the tomb of John the Blind, as colorful and valiant a warrior as ever brandished a sword. He was Count of Luxembourg as well as King of Bohemia. When stricken blind, he still fought on, wherever a fight was to be found. He led his troops personally at the Battle of Crécy and was killed there fighting for his ally, France.

A popular story, though historians discredit it, is that the British forces were so impressed with the bravery of John the Blind that they paid him the compliment of stealing his ostrich plumes and his motto, *Ich Dien* (I Serve). These were adopted as the badge of Britain's Prince of Wales, and still remain so.

The government of the Grand Duchy centers in buildings close to the palace. There is a Chamber of Deputies of 51 members and a Council of State of 15 members, the latter appointed by the Grand Duchess for an indefinite term. Hardly ever is the country shaken by that bane of liberal democracy in Europe, the cabinet crisis, or *crise*.

Iron and steel form a tremendously stout prop of Luxembourg economy, for they are big business throughout the southern portion of the country.

More than 7,766,000 tons of minette (iron ore) were mined here in 1937, for example, and 5,000,000 tons of pig iron and steel, in about equal proportions, were produced. All this is greatly curtailed at present because of Luxembourg's difficulties in obtaining coal.

ARBED and HADIR are the composite names (made from initials) of the two largest companies, which dominate the industry. Arbed's building, on the land between the Pétrusse viaducts and the railway station, is one of the most modern and pretentious in the capital. During the Battle of the Bulge it served as Headquarters of Maj. Gen. O. P. Weyland's XIX Tactical Air Command, cooperating with General Patton's Third Army.

The steel region in the southwest is as smoky and drab as it is industrially important, but Mondorf les Bains in the southeast, Luxembourg's one bid for the society that visits spas, is as neat a little resort as ever brought wry faces to those who quaff curative waters. The whole northern half of the country is a glory of travel, despite the pitiless battering of war which laid 38 percent of the country in ruins.

Potatoes Left for Poor and Proud

Rising from war, this little land is helping herself. From one end to the other—only a two-hour drive—one sees a country at work. New roofs are rising against rain and cold. Granny tends cattle in the dewy grass and knits warm socks for winter. Sturdy folk harvest potatoes and grain. Beside the Moselle young girls pick grapes. Children drive home the herds at dusk.

In one field Maynard Williams, who made the photographs for this article, noticed what seemed like waste: many good potatoes left on the ground.

"Our poor people are proud," his driver explained. "But anyone is allowed to pick up what the harvesters leave behind."

Echternach, scene of the famous Dancing Procession in honor of St. Willibrord, is a town of insistent "personality." It lies on the south bank of the small Sûre River, with

A War-born Youngster Ponders a Picture-taking Yank from Her Shell-pocked Home

Bashful, she shows but half her body, as if still wary of flying death. Her home town of Esch sur Sûre, near a road leading to beleaguered Bastogne, saw heavy fighting between American and German troops in the Battle of the Bulge. Because of its valley location, the town is sometimes called Esch le Trou, "Esch in the Hole."

At a Frontier Customs Station a Luxembourg Official Checks Goods Bound for Germany's French Zone

Across this temporary American-built bridge spanning the Moselle River merchandise commands far higher prices. In 1922 Belgium and Luxembourg entered into a customs union. In 1944 the Netherlands Government agreed to join it, and early in 1948 Benelux, a three-way union, went into effect.

In His Wooden Hamper He Collects Grapes for Wine

Climbing down steep vineyard slopes to a giant wheeled vat, he bends from the waist to spill his load. Luxembourg vineyards produce between one and a half and two million bottles of wine a year, mostly for export.

In Busy Luxembourg a Pinafored Youngster Lends a Hand

She cuts white grapes for the Grand Duchy's celebrated light, dry Moselle wine; 1947 was an excellent vintage year. Terraced vineyards cover some 3,000 hilly acres along the Moselle River (page 800).

Germany across the way on the north bank. A partly Roman bridge used to connect the two, but it was bombed to dust in 1944, for here Von Rundstedt launched one wing of his massive offensive.

The town is a tragic wreck, yet I found holiday in full swing. Twenty or more hotels had reopened for tourist trade (page 802).

Echternach Dances to Honor a Saint

On an earlier occasion, before the war, I witnessed the Dancing Procession, which occurs on Whit-Tuesday, the 52d day after Easter. Fifteen thousand persons participated, dancing from the German side of the river across the bridge to the town church and the tomb of their holy patron, St. Willibrord, who cured the local cattle of a bovine affliction more than a thousand years ago.*

They danced or capered five steps forward, three back, five forward, three back, and so on, forming ragged lines held together by linked handkerchiefs which the dancers clutched in either hand.

Some of the young men were dancing as hirelings for others who wanted to honor the saint but had not the strength to do so personally. But thousands of the dancers were older folk. Some of the stout old grannies, I thought, would certainly die of exhaustion after another five-and-three, but I heard of no fatality. Forty or fifty brass bands and numerous groups of violins filled all the air with sound.

A priest surveying the long line saw a cluster of girls whose arms were *bare!* He sent them home to put on their coats, though the temperature was 85°. In such matters, Luxembourg is highly conventional.

In the postwar era the Whit-Tuesday procession goes on as of yore, though it cannot cross the bridge that isn't there, and St. Willibrord's remains are no longer in the town church but in the crypt of the abbey basilica where they were placed for protection from bombing.

This basilica is itself a war victim, an almost total ruin, but Luxembourg hopes to restore it. A restoration worker took me in to see the tomb, lighting a newspaper as a torch, for the place was as black as solid jet.

"You're on your own, monsieur," he said pleasantly. "It is forbidden to enter here. Pieces of stone still fall from the cornices. Look here," and he showed me a bad gash in his scalp where a fragment had fallen on him.

Echternach, in its contrast of tragedy and gaiety, seemed to me a living laboratory of human behavior. Three modern invasions, the last a cyclone of steel and explosives, have left its habits and ways of life unaltered.

Vianden is on the Our River, which forms the Luxembourg-Germany frontier for many miles. But at Vianden a Luxembourg pocket about a mile in depth extends into Germany on the east bank.

Of all towns in the Grand Duchy, Vianden is the most spectacular for beauty of site. Occupying both banks of the Our, it climbs the hills steeply and culminates in the sky-piercing 10th-century castle of Orange-Nassau-Vianden, which looms like a symbol of feudalism high above town and river. From this castle came the present ruling dynasty of the Netherlands.

When I first visited it, between world wars, the castle was impressive and even dispensed a certain aura of gaiety, for I read and took down a very jolly death notice, that of "Madame War," dated November 11, 1918. It concluded with the words:

> The Families Death, Misery, Illness, Devastation have the great pleasure of informing you of the long awaited loss which they have just suffered in the person of
>
> MADAME WAR

A thousand times alas! The old lady was not dead at all, but merely playing possum. She recovered, returned in 1940, and came again in 1944, utterly wrecking the château on the latter occasion. It is now a labyrinth of scarred and towering walls that reach for heaven. But the castle's verdant terraces still offer the same incomparable view. *That* the bombs and artillery of the Rundstedt Thing could not obliterate.

Victor Hugo was an exile in Vianden in the dark years of 1870 and 1871. His house, on the bank of the Our, was a prewar museum, but it is now a bomb wreck and its contents have been rifled.

Clervaux's Connection with FDR

Clervaux, almost at the "stem" of the pear-shaped Grand Duchy, is proud of its connection with Franklin Delano Roosevelt by way of the Delano component of his ancestry.

A noble family of this village bore the name of De Lannoy. A member of another branch of the family, Philip de Lannoy, or De La Noye, was born in 1602 and sailed from Holland to the New World in 1621 on the ship *Fortune*. He landed at Plymouth, Massachusetts, to join the colony established the previous year. The second generation changed the spelling of the name to Delano. Sara Delano Roosevelt, and hence her son Franklin,

* See "The Grand Duchy of Luxemburg," by Maynard Owen Williams, NATIONAL GEOGRAPHIC MAGAZINE, November, 1924.

A Roadside Picture Map "Blows Up" Tiny Luxembourg for Touring Visitors

"U. S. Military Cemetery, Hamm" adds its linguistic variation to a signboard map near Steinfort by the Belgian border. In this land of linguists many Luxembourgers speak French, German, and English besides their native patois. In the Middle Ages their country was four times its present size. Various treaties between 1659 and 1839 reduced it to 999 square miles, about four-fifths as large as Rhode Island.

were direct descendants of Philip de Lannoy.

Luxembourg's Clervaux had had a long life and a pleasant one, by and large, until the Nazi scourge of 1940 and the Rundstedt horror of 1944-45 wrought indescribable havoc. The Nazis desecrated Clervaux more grossly than any other Luxembourg village by setting up one of their largest and most arrogantly ordered Hitler schools in the Benedictine abbey that dominates a lofty ridge cleaving Clervaux like a gigantic snowplow (page 801).

For forty years this abbey has seemed to float like a banner of heaven over the village, but religion, venerable tradition, and even a decent reverence for the abbey's architecture were brushed aside callously by the Nazi trainers of youth. The round Romanesque windows were cut square to make it a better factory of brutality. The abbey church was used, and abused, as a gymnasium.

Two Luxembourg gendarmes pedaled up the long, steep slope on bikes and happened to enter the church at the same time I did. I expressed aloud my sense of shock at the awful wreckage of the interior:

"The Allied bombardment, I suppose, did this in driving out Von Rundstedt."

"But no, monsieur," said the gendarmes,

Willing Hands Help Plucky Luxembourg, Survivor of Invasions, to Rise Again

For more than a thousand years the tides of war have swept across the little country. World War II, with its aerial bombardment and hard-hitting mobile forces, dealt the cruelest blows. Without fanfare, industrious Luxembourgers have tackled the formidable task of reconstruction. "From one end to the other," reports the author, "one sees a country at work." This building in battered Ettelbruck has now been completed.

both speaking together. "The Boches did that. Not the bombardment."

"Do you mean," I persisted, "that the Germans did all this damage just in using it as a school?"

"Absolutely, sir. Not one bomb ever touched it. The Nazis did it to show their contempt for religion. And when they were driven out they added damage to damage. It was spite then."

The parish church, halfway down the great ridge, did suffer from artillery bombardment, and the old château at the apex of the "plow" was gutted and completely ruined in the Battle of the Bulge, as was the southern tine of the forked village itself.

On an old monument commemorating events in the War of the Peasants, 1798, during the period when Napoleon swept Luxembourg into his collection of territorial trophies, I read a motto in the Luxembourg language: FIR GOTT A FIR VATERLAND (For God and for Fatherland).

There had once been another word just preceding the word "VATERLAND," and by a bit of Sherlock Holmes deduction I assumed that it had been "DEUTSCHES" (German). There was exactly space enough for that many letters. But the word is expunged for all time.

I should not be surprised if, upon my next visit to Clervaux, I should find both the last word and its preceding void replaced by the name of this freedom-loving land itself, so that the motto would read: FIR GOTT A FIR LETZEBURG.

Cloud Gardens in the Tetons

By Frank and John Craighead

With Illustrations from Photographs by the Authors

FROM wartime service in warm oceans and hot tropical forests, we had returned to Wyoming—to the Jackson Hole valley and canyon roads of snow, to a dazzling whiteness scarcely toned down by forest green, to nightly subfreezing temperatures.* Our wives, Margaret and Esther, had waited for us in a log cabin on the Snake River.

Now we were packing our gear in to snow-buried cabins of the X⌣X Ranch, owned by "Uncle Jim," a homesteader who had arrived in this part of the country in the midst of a snowstorm, with $17.50 his total capital. The four of us webbed in with a load at a time.

Taking off our packs, we read the sign on the door. "If I'm not at home, I'm off fishing. If I don't come back, see if you can make a living off the place."

Old Jimmy was home, however, and welcomed us with a dinner of elk steak, fried parsnips, potatoes, muffins, coffee, and the remark, "Come and get it."

Wilderness Fun Even in Winter

During the following weeks the spring sun slugged it out with gray snow flurries that roared down the canyons of the Tetons and attempted to spread over the valley.

Although looking forward to spring, we were not anxious to see winter go. There were skiing and ice fishing. There were wonderful light snows for tracking mink and marten, or for reading the story of beavers at work.

The deep snow blanket slowed down the gaunt moose and elk so that we could overtake and photograph them from snowshoes. On one such chase Frank pressed a cow moose and her yearling too close and went up an aspen tree as she turned and charged him.

Days of fly-fishing from snowshoes, when we froze the trout beside us as fast as we pulled them in, passed all too quickly. As if by magic a hot sun burned the snow blanket until the tops of the fences showed, then the tips of the sagebrush.

Warm winds whipped away the evaporating moisture, while the porous glacial soil absorbed the melted snow and slowly released it to the Snake River. Almost overnight spring had come to the valley, and winter slowly receded up the mountains.

Buttercups turned the first bare ground to a glistening gold. Shaggy, ill-tempered moose dragged out of the Snake River willow bottoms, waded into the unfrozen beaver ponds, and daily grew warier as they gained strength and flesh from the slimy green algae.

Grouse drummed in courtship day and night. Seldom glimpsed, Wilson's snipe performed their evening nuptial flights, their directionless, winnowing whistles seeming to come from dead trees in the swamp, from steepled spruce trees, from the dusky sky directly above, or from low in the sedge-lined channels leading to the beaver houses.

A lonesome saw-whet owl calling vainly and monotonously for a mate, the hoots of nesting great horned owls, the ripples left by rising trout, aspens turning green and willows red—all said that winter snows had retreated for another short half year. A move to summer cabins on the STS Ranch, owned by two naturalists, the Murie brothers, placed us within sight and sound of this and much more.

With the appearance of the first buttercups, spring beauties, and yellow fritillaries, we checked our camera equipment, got together flower presses and vasculum, and, with permission from Grand Teton National Park officials, prepared to photograph the alpine flowers (map, page 813).

Snow still lay deep in the mountains, the flowers dormant beneath it. However, we could start photographing mountain-climbing flowers such as the buttercup, glacier lily, and spring beauty that bloom first in the valley, then follow the receding snows up to timber line. There were also valley flowers, the earliest bluebells and larkspurs.

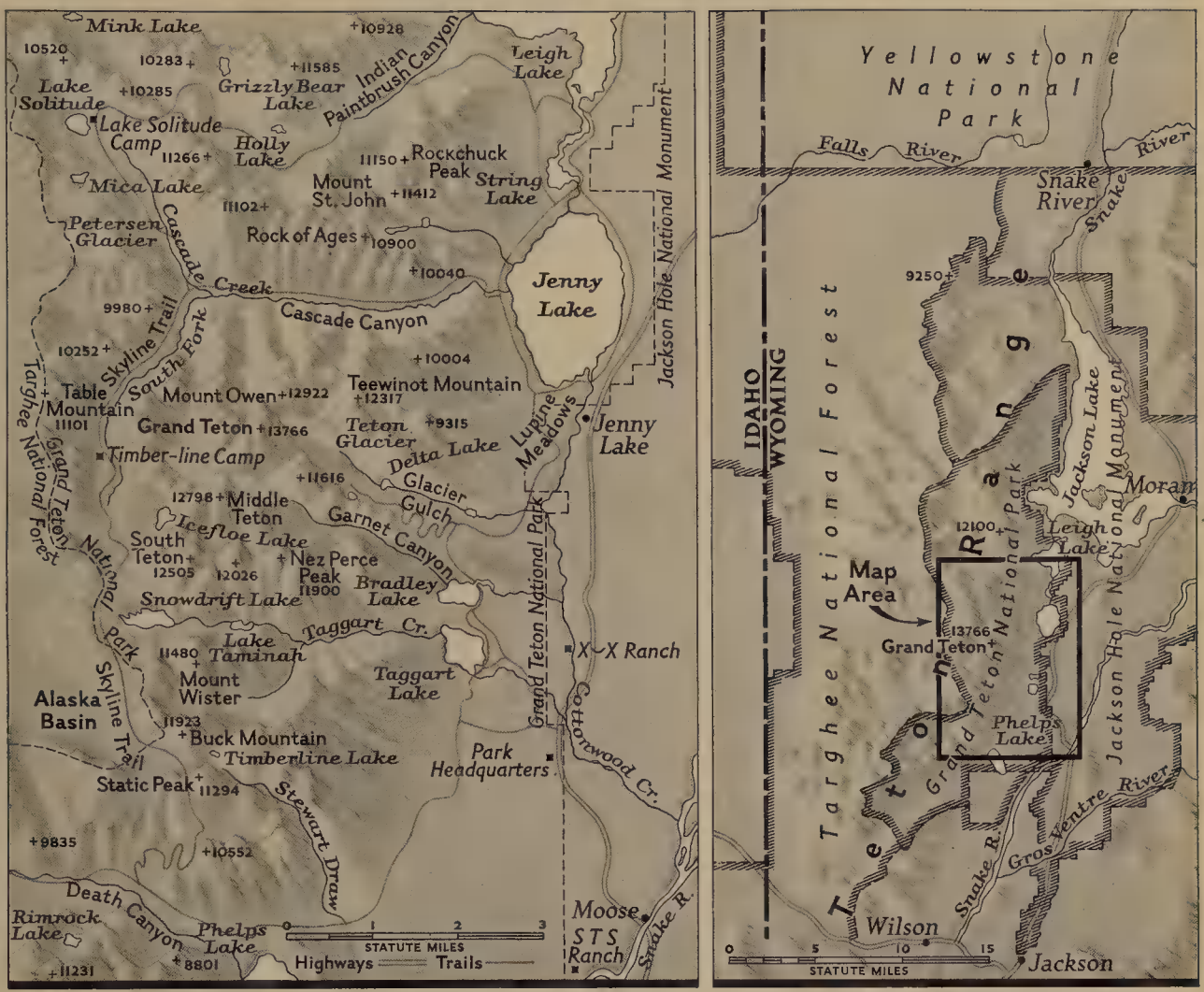
Supplies Must Be Light

To back-pack up to the alpine regions, we had to select a minimum of equipment, with emphasis on lightness and utility. We started with the food. On a smoke rack open to the sun we placed salted strips of beef. The combined action of sun and aspen smoke

* Frank and John Craighead wrote for the National Geographic Magazine their experiences as young hobbyists hunting and taming wild birds, "Adventures with Birds of Prey," July, 1937, and "In Quest of the Golden Eagle," May, 1940. Through the first story they received an invitation to visit a royal fellow-falconer in India, and the story of their experiences, "Life with an Indian Prince," appeared in the National Geographic Magazine for February, 1942. Their Navy service is recounted in "We Survive on a Pacific Atoll," January, 1948. Graduates of Penn State College, they are at present working on their Ph.D. degrees at the University of Michigan.

Braced on the Edge of Eternity, Frank Craighead Collects a Rare and Lonely Alpine Flower

A misstep would plunge him a thousand feet to the misty valley below. To color-photograph and collect flower specimens from Nature's alpine rock gardens, John and Frank Craighead, their wives, and friends spent four months among skyscraping peaks in western Wyoming's Teton Range.



Drawn by H. E. Eastwood and Irvin E. Alleman

From Lofty Mountain Camps the Craigheads Roamed a Wild, Primeval World

In early spring and summer expeditions they explored the central section of Grand Teton National Park. In its 150 square miles of rugged mountain grandeur, the park includes the highest peaks of the saw-toothed Teton Range. To make this majestic range, elemental forces in recent geologic times heaved and broke a giant earth block. Ice Age glaciers, carving alpine peaks and gouging deep canyons, hewed the continent's most jagged skyline. Headwaters of the Snake River excavated near-by valleys. Dotted lines on the map mark the chief park trails; the expeditions' camps were temporary.

produced jerky, tasty dried meat now greatly reduced in weight and volume (Plate III). Hard and tough as chips of wood, it was stored in cloth bags. Fish were likewise salted and dried to the brittleness of crackers.

Corn and wheat were parched; dried foods such as peas, potatoes, soups, milk, prunes, and raisins were purchased, as well as rice, flour, noodles, and corn meal. Concentrated quick-energy foods like sugar, honey, nuts, chocolate, and peanut butter were added.

When the bulk and weight of our food could no longer be reduced, we turned to other items. Our tent, a light waterproof nylon tarp, did extra duty as a pack. Rigged with removable chest and shoulder straps as well as tumpline, it functioned as efficiently as a pack board. The nylon rope of the pack rigging would also serve for pitching our tarp tent (page 828).

A machete instead of an ax, a half-size flower press, 35-mm. cameras, light metal tripod, thin aluminum cooking utensils—all lowered the ounces that grew to pounds as, one after another, items of equipment were added or discarded on a basis of weight.

When joined by our friends Dave Spencer and Bob Patterson, and Bob's wife Hazel, we started on our first trip. It is an unwritten law of the mountains that those who venture into them on foot must carry their own gear. Wives are no exceptions. Thus the girls were carrying packs as large as ours but not as heavy, the difference being due to additional food we had offered to carry for them.

From the sagebrush of the valley we followed the trail over glacial moraines cloaked in lodgepole pine, and climbed gradually up Cascade Canyon into the subalpine zone of

Legs and Lungs Attuned to Steep Slopes and Thin Air, They Hunt the Alpine World's First Flowering Signs of Spring

Squatting on Snowshoes, Frank Fly-fishes an Opening in Thawing Taggart Creek for the Season's First Trout

When Camp Life Was Streamlined, Wives Assumed Familiar Chores

They get breakfast while the men prepare for an early start. A hot, dry spell forced the alpine flowers into their short, colorful blooming period early. Camper-ecologists took up the challenge. They specialized their jobs and worked long days to finish while the blossoms lasted. During the summer they took more than 2,000 color photographs, including hundreds which preserve the beauty of 200-odd flower species.

fir and spruce. The lower canyon was colored with pink and white spiraea, with penstemons, purple fringes, red paintbrushes, and a few early-ripening huckleberries.

Higher up the canyon we hit snow, first the packed snow of an avalanche that had plunged down the exposed southern wall and swept across the canyon floor, carrying with it tons of rock as well as the scattered, mangled remains of fir and spruce.

Later we trudged through melting snow and found Lake Solitude still partly locked in ice, the shore line covered by a foot of snow (Plate II).

Beside this glaciated lake at the head of the canyon we made our base camp. We pitched our tents on a small grassy site, free of snow because of its position on the south side of a huge granite boulder. The boulder served as a windbreak and as a reflector for our fire.

Our icebox was a trench in the snow, and our drinking water came from the melted lake edge. A few fir boughs insulated our sleeping bags from the ground dampness. Our firewood was the dead dried branches of spruce and fir—stunted trees that represented years of slow, patient growth.

The Old Question: Who Cooks?

Camp pitched, we were ready to eat. A relay of understanding glances was a signal for the men to investigate the open water where feeder streams entered the lake. It was important, we felt, to stretch our food supply by catching trout—catching them immediately, before we became involved in cooking supper. Outdoor cooking is a man's job, and we intended to do our share—when it didn't interfere with fishing (page 815).

The next day our wives showed us that they, too, intended to fish even if it interfered

A Warm Smile Belies the Icy Coldness of Her Mountain Foot Bath

Margaret Craighead seems a water sprite in dungarees and sweater as she bathes tired feet in a limpid mountain pool. In a cabin in remote Jackson Hole, a valley adjacent to the Teton Range, she and Esther Craighead awaited their twin husbands' return from Navy service in the South Pacific. They kept alive the hope of a prolonged postwar sojourn among the high peaks.

with cooking or with our self-assumed job of getting food. In late afternoon, just when the surface water had warmed sufficiently for the trout to feed, the girls took our only two fly rods and headed for the open inlet. Just too late, we returned from photographing with the same purpose in mind. The tables turned, we started preparing supper.

Campers who don't cook their own meals must eat the concoctions of companions. Every camper seems to have a favorite goulash that is like ambrosia to his whetted appetite, but tastes just as it looks to everyone else. Bob's was so-called rice pudding: sticky undrained rice, raisins, and prunes.

At the first helping the girls regretted having left the cooking to us. To prove the mess was edible, we continued to consume one cupful after another long after the girls had called quits. In the morning there was no argument when we picked up the rods.

For breakfast we had the sweet pink meat of trout that had passed more than half their lives beneath a thick layer of ice and snow.

Between sunrise and 8 o'clock there was usually a period of calm. No wind battered the white, woolly heads of the long, thin-stemmed bistorts. The fringed grass-of-Parnassus stood upright and motionless.

The light was bright, the shadows soft. It was the time of day when we set up our cameras, took a picture, and moved from one flower to another. Along with the heat of the day came the winds, persistent breezes that would slow down, cease for an instant, then tantalizingly start up stronger than before, making photography difficult.

Nevertheless, our list of photographed flowers grew—globeflower, glacier lily (or adder's-tongue—Plate V), marsh marigold, Smelowskia, Potentilla, white mountain heather (not a real heather, despite its name),

shooting star, phlox, Polemonium, and erigerons. Our flower press expanded so that none of us wanted to pack it down the mountain (page 828).

Each day took us over miles of mountain meadows, up the peaks to the farthest penetration of seed plant growth, and often on to the summit for the fun of it. Sometimes together, at other times widely separated, we crossed the talus slopes, climbed the snow fields and glissaded down them, explored cliffs, ledges, and chimneys for new flowers to collect and to photograph.

Our legs no longer complained of the day's exertion; our lungs adjusted to the rarer atmosphere. We felt like staying forever up in the clouds, in the invigorating air, in the rock gardens above the valley.

As our appetites increased, our food supply dwindled. We supplemented it with fish, mountain sorrel greens, and the green pods of glacier lilies, but the inevitable faced us. We must temporarily leave the cloud gardens and descend to the valley for more food, more film, and a fresh start.

Back to the Peaks in August

In August we were again in the mountains, camped this time near the head of the South Fork of Cascade Canyon, where two streams originating in snow fields above us formed a V on joining.

We were at timber line, and above us towered a tremendous limestone wall the stratified structure of which contrasted with the Pre-Cambrian granite of the Teton peaks. Beyond it lay picturesque Alaska Basin, tucked away in the Targhee National Forest. This calcareous soil would support flowers we had not yet found and photographed.

Above the cliffs and peaks, birds of prey soared and wheeled on rising air currents while hunting the treeless flower meadows below. Swainson's hawks, ferruginous rough-legs, sparrow hawks, and prairie falcons maneuvered apparently unhampered in the rarer air at 11,000 feet, while the golden eagle soared to 13,000 and above to look down on the peaks of the entire range.

Cliff swallows and rosy finches nested on cliff faces and in crevices above timber line. Lower down, pipits and white-crowned sparrows were hatching their young in the sprawling, matted fir growth. In the rock slides conies, or pikas, were harvesting flowers, piling and curing them in colorful scented "haystacks."

A hot, dry spell had brought the alpine flowers to the height of their blooming season several weeks early. The dryness was likewise rushing to a close their already short lives. Fields of golden mountain sunflowers, lavender erigerons, yellow, pink, and scarlet paintbrushes, dark-blue lupines, sweet vetches, mountain roses, stonecrops, various colored mustards and anemones seemed to be racing frantically to flower and produce seeds.

This rush and hurry proved contagious. We were forced to fall into the swing in order to photograph the numerous flower species while their brief glory lasted.

As we took up the challenge and entered the race, camp life was streamlined. Dave would perhaps start a fire, the girls would cook breakfast and portion out food for lunches (page 816).

John would take advantage of the early-morning sun to photograph a flower. Bob would secure the tents and protect our gear from possible storms. We'd then eat a breakfast built around cupfuls of oatmeal or cornmeal mush and be off, sometimes to locate new flowers, sometimes to hurry to a previously located flower, timing our arrival to coincide with the best light conditions.

In the evenings we would drop down from the peaks, the ridges, and the high saddles to our timber-line home. Sometimes we would schuss the snow fields on our feet or angle down the steep, rocky talus slopes in long bounds. All of us returned hungry and tired.

While supper was cooking, we pressed our flowers and keyed out strange or doubtful species in our books. Sometimes we finished writing notes by firelight. Each evening we would add to our list the new plants photographed. On days when weather conditions were poor, we would chalk up only two or three; on our most successful day John and Margaret photographed 30 different species.

Thrilling Quest of Purple Saxifrage

While Dave and Frank keyed plants and wrote notes at camp, John, Margaret, and Bob started off for Alaska Basin, photographing each new plant they encountered. They hoped to find on the high, rocky ridge the small purple saxifrage, *Saxifraga oppositifolia*. The day before Dave and Frank had covered 20 miles of high ridges and slopes, looking for it with no success.

This tiny alpine flower was of special interest, because it not only perches high on the mountain slopes of the Rockies but is found in similar habitats in the Alps and the mountains of northern Europe and Asia. As an old friend, this hardy adventurer greets the mountain lover on the Grand Teton and on the Matterhorn.

John, Bob, and Margaret dropped down

I **Billowing Clouds over the Tetons Herald a Storm's Approach**

Frank Craighead prepares to photograph scenic wonders from atop 11,412-foot Mount St. John, in Grand Teton National Park, Wyoming. To such heights the authors and their wives climbed in search of alpine flowers. Water from Jackson Lake (background) irrigates farms along the Snake River in Idaho.

© National Geographic Society Kodachromes by Frank and John Craighead

Brilliant Paintbrush and Beaming Erigerons Invite a Climber to Rest

On her way to gardens high above timber line, Margaret Craighead pauses for a breather.

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Kodachrome by Frank and John Craighead

Glacier Lilies, First to Hail Spring, Nod Demurely Beside Lake Solitude

ce goes out and melting snow trickles down from the Teton crags (background), mountain flowers spring up and hungry trout start feeding on the surface. Here Esther Craighead admires a patch of newcomers.

III **Sun and Aspen Smoke Turn Beef into Easy-to-pack Jerky**

Forced to carry two-week supplies of food and equipment on their backs, the Craigheads dried meat on a rack over a slow fire. The resulting product, tough as wood, was greatly reduced in weight and volume.

© National Geographic Society Kodachromes by Frank and John Craighead

Poor Fish! Adroit Work with Bare Hand Proves a Sucker's Undoing

Frank Craighead here demonstrates the art of "guddling." Cautiously the guddler gropes under a log or rock until he feels his quarry. Then he eases his hand forward and clasps the fish near the gills.

IV **Gay Colors from Nature's Palette Brighten a Harsh Environment**

Left, sky pilot or skunk flower *(Polemonium viscosum)* grows among rocks from 10,500 to 12,100 feet. The crushed plant emits a skunklike odor. Center, mountain heath *(Phyllodoce empetriformis)* forms pink patches up to 11,000 feet. Its in-rolled leaf margins hold moisture at heights where water is often scarce and evaporation high. Right, paintbrush *(Castilleja rhexifolia),* Wyoming State flower, carpets large areas from valley floors to mountain peaks.

© National Geographic Society Kodachromes and Ansco Color by Frank and John Craighead

Like Clown Faces, Red Monkey Flowers Grin Beside a Canyon Stream

This species of the snapdragon family, *Mimulus lewisii,* was named for Meriwether Lewis. Its genus name derives from the Greek word for ape. The perennials prefer moist places but are also found in alpine meadows. Here they share a patch of ground with mountain bluebells *(Mertensia sibirica)* and golden ragwort *(Senecio triangularis).*

V

Hardy Flowers of the Tetons Grow and Bloom Quickly

Nature equips all to make a brave show despite long winters and short summers. Left, dogtooth violet *(Erythronium grandiflorum)*, also known as glacier lily (Plate II). Indians eat its bulbs, seed pods, and leaves. Center, columbine *(Aquilegia coerulea)*, State flower of Colorado, ornaments canyons and climbs to timber line. Right, alpine buttercup *(Ranunculus adoneus)* is related to larkspur, anemone, monkshood, baneberry, clematis, and meadow rue.

© National Geographic Society Kodachromes by Frank and John Craighead

Alpine Sunflowers Turn Their Backs on Mountain Grandeur

These specimens of *Rydbergia grandiflora* face east; behind them lie Alaska Basin, in the western watershed of the Tetons, and distant Idaho. Near this spot passes Skyline Trail, part of a 90-mile network penetrating areas of Grand Teton National Park, which only a few years ago was an unbroken wilderness.

© National Geographic Society

Kodachrome by Frank and John Craighead

Knee-deep in Arnica, ■ Flower Hunter Gazes at the Grand Teton, Flanked by Mount Owen and Middle Teton (Extreme Right)

Pass the Raisins, Please! Light Rations and Equipment Are the Rule for Teton Mountaineers

Frank (left) and Margaret Craighead and Bob Patterson relax at their camp in Cascade Canyon. Nylon tarpaulins (background) served as both shelters and packs.

© National Geographic Society

Kodachrome by Frank and John Craighead

© National Geographic Society

Kodachrome by Frank and John Craighead

Down He Goes! Frank Craighead's Life Hangs by a Slender Rope

He descends Mount St. John (Plate I) by rappelling, with the rope passing over his shoulder and around his left leg. Below him lie Leigh Lake in the foreground and Jackson Lake in the distance.

below timber line on the slopes that carried the mountain rain and melting snows out to the plains of Idaho. *Oppositifolia* had eluded them all morning, and at noon they decided to climb back to the divide, then follow it south in their search.

A half hour of upward plodding, and they stopped to debate. A storm was rolling in from the southwest, and thunderstorms mixed with mountain peaks and ridges produce trouble. Should they risk entanglement in such a brawl?

The storm, they argued, might be deflected by a peak or pass through a canyon, missing them completely. Once on top, they could perhaps drop down the far side to shelter and be well on their way to camp. They decided to go on climbing.

The onetime distant thunder was soon breaking directly overhead. Clouds rapidly dwarfed the view. Almost at the top they turned back. The air was charged, crackling. Electricity stood their hair on end, made their skin tingle. The wind came in violent gusts. Lightning struck close by, leaving a strong ozone smell in its wake. They raced for timber line.

A band of elk crossed their path, likewise headed down. Again the lightning struck. John thought of temporarily abandoning his metal tripod and camera as a tingling played up his arm, but he could find no protection for it. Rain and hail flailed them as they crawled into timber-line lean-tos, natural shelters beneath the thick matted roofing of stunted firs.

It is in such places that mountain sheep and elk bed down. Gnarled, ageless, dwarfed trunks support a thick mat of foliage flattened and contoured to the mountain by prevailing winds and heavy snows. Streamlined to meet the blasts of a century of storms, they took this one as they had all others. Rain and hail, their force spent on the cushion of needles, trickled down to the dry soil below.

Thundering and mumbling, the storm moved quickly on, tagged by the sun reflected in a million water crystals adhering to the flowers. The scattered hail soon disappeared.

Elusive Flower at Crest of Ridge

Climbing again, the plant hunters made the ridge. On top they stopped to photograph a beautiful tiny member of the Mustard family, *Draba*. Its yellow blooms were still sparkling from the rain.

On the highest rise on the ridge, the top of the limestone wall, they saw, at last, the light-purple flowers of a single clump of *oppositifolia*. The search was over.

John set up his camera, moved it as close as he could to the diminutive flowers, and took a picture. Margaret curled around the plants to shut off the wind.

Evening was at hand and camp was a long trek away, unless they could take a straight course, a short cut. The wall in front of them dropped 1,000 feet to the canyon floor. A long detour would take them down there, with yet another high saddle to climb before dropping into Cascade Canyon and camp.

But from a break in the precipice they could reach a wide, sloping, snow-covered ledge running horizontally across the lower cliff face. If they could follow this over to the saddle, they would hit a long, steep snow slide and could glissade almost into camp. It was worth a look.

They climbed down to the ledge, following tracks of elk caught in the storm. At the ledge the elk had stopped, backtracked, and sought another route of descent.

Short Cut Proves Perilous

John, Margaret, and Bob hesitated. The ledge had a 50-degree snow slope. Without ropes and an ice ax it was dangerous. It was also shorter. One slip, a short slide, and they would drop over a cliff varying from 40 to 100 feet and land on a nearly perpendicular snow slope that ended in a mass of huge boulders.

John thought they could make it. Margaret and Bob were not sure. Another storm struck, sweeping over the wall from the west. They waited it out, huddled against the precipice for protection. When it passed, the canyons were in shadow. Only the peaks reflected the sun.

They decided to try the short cut—cross the ledge. John handed Margaret the tripod to use as an emergency ice ax. They moved slowly, kicking each foothold in the crusted snow slope.

The ledge was cut by deep crevices formed by water constantly freezing and expanding in confined cracks. Tremendous sections of it were false fronts of millions of tons of limestone rock pried loose from the mountain proper and getting ready to fall. They might cling another 50 years or fall tomorrow—tonight!

Margaret slipped, fell, dug the tripod in, and stopped. That was enough. John took chances, but he didn't like Margaret taking them—not when he had to watch.

They retreated, following their ice steps back, and descended a chimney to the snow field. Then they took off in a glissade that shot them downward, three blurred figures barely discernible amid sprays of snow.

Their eyes watered; their feet barely

Evening Brings the Job of Classifying and Pressing the Day's Flower Take

The Craigheads combined vacation with work on their doctorates in ecology, which deals with effects of environment on wild animals and plants. Mountain plants evolve strange adaptations to preserve life-giving moisture and produce seeds rapidly. Because the season is short, many bloom as soon as the snow melts off. Flowers are large in proportion to the plant and exceedingly colorful, insuring quick cross-pollination by insects.

Nylon Tarp and Fresh-cut Fir Boughs Keep Sleepers Dry, Top and Bottom

Since man and woman power carried food and equipment to timber line, supplies had to be light. The tarpaulin doubled as tent and pack; nylon pack ropes pitched the tent; a machete served as an ax.

touched the snow. An icy lump would lift them off the surface for 20 feet. A shift of weight to their heels made the snow fly more thickly, strained leg muscles, but served as a brake. A turn of the toes started them on a traverse or guided them to either side of an icy rib.

A second on the snow saved minutes climbing over rock. They were off the cliff, they were safe on the canyon floor, but it was not the camp canyon. A tiring climb up and over the saddle, a long hike down in the dusk, and they reached the camp, tired, hungry, but happy. *Oppositifolia* had been added to the list.

A Sure Cure for War-taut Nerves

The campers were ready for them with a huge kettle of pea soup, cooked with jerky, and a batch of fluffy biscuits baked in a rock pit oven.

Dave boiled some dried potatoes and whipped them with dried milk. Esther cooked the soaked prunes we were saving for breakfast and put out honey and peanut butter for the biscuits. Fragrance of coffee permeated the air. John, Margaret, and Bob dug into the meal, and the others kept pace with them.

The kettles emptied and our hunger satisfied, we sprawled contentedly about the campfire, leisurely sipping coffee. Bob broke the ensuing silence: "How could this be better?"

John answered, "It couldn't."

Dave was silent, but his eyes agreed.

They meant all that made up this way of living—this fulfillment of long-cherished hopes. They were thankful for the freedom and quiet, for the surroundings that had been preserved for us and for all Americans who choose to enjoy them.

Ice Ax and Bare Hands Help Climb a Snowfield's Steep Ascent

High in Cascade Canyon on the spring expedition, John and Margaret Craighead hit snow—first the hard-packed remains of an avalanche, later the melting whiteness of retreating winter. From the base camp on still-icy Lake Solitude they scaled snowfields to reach early mountain-climbing flowers. At day's end they glissaded "home."

Could the farsighted men responsible for our public land system of parks and forests have looked across our campfire and seen how a summer in this environment had erased the war lines in Bob's face, the tired look in his eyes, they would have felt repaid. More than four years' duty on a destroyer from Pearl Harbor to the Philippine Sea were being forgotten. Dave's gaunt face was filling in. The strain of flying was gone. He was again almost as we had remembered him.

Lightning was playing among the peaks; the storms that had been milling around all day

A Dwindling Glacier Hints at the Bulldozing Power That Carved the Tetons

The retreating glacier leaves walls of crushed rock debris which it pushed forward in its prime. During earth's Ice Age mammoth glaciers sculptured the rugged outlines of the Teton Range. Much of the range is above timber line, and the high peaks lie in the realm of perpetual snow. Vestiges of these mountain-shaping rivers of ice remain in the upper reaches of Grand Teton National Park.

seemed to have fused at last in one rumbling mass of clouds and searing flashes. A brief stillness settled around camp, the whitebark pines stopped whispering, and we could hear the trickling of the stream.

In full accord we rose simultaneously, checked tent ropes, threw a handful of dry kindling under a tent, piled rocks on cooking utensils, placed cameras and film in waterproof bags, and crawled into our shelters just as the wind zoomed over the wall with a roar and dashed down into the canyon, driving the rain with it.

We were in a huge rock bowl with the wind as a mixer. It seemed to take the rain, lightning, thunder, rocks, trees, the tents, and ourselves, mix them thoroughly, and whirl the contents off into a darkness vibrating with thousands of discordant, deafening sounds.

The storm's fury was so awe-inspiring that we lost track of time, place, and direction and were surprised, as the onslaught slackened, to see that we were still under a tent, soaked, chilly, but with our rolled-up beds and equipment relatively dry.

The next morning light snow covered the peaks and clouds filled the canyons. They drifted low over the alpine gardens. They let the sun through here and there, but never for long. The mood of the mountains had changed. Water was in the soil, moisture in the air. The plants responded. Their flowering season had been lengthened. For a few days more they would color the landscape.

But the snow had started down the mountain. It would descend to the valley, bringing winter just as inexorably as it had climbed, leaving spring behind. The beauty of the alpine flowers would lie dormant for nine long months, awaiting the time when they could again enrich the mountains with their color and life.

Mapping the Nation's Breadbasket

By Frederick Simpich

IT WAS June. Flying west over Lake Michigan, steering our plane for Illinois skies, we saw Chicago's towers suddenly poke up from the blue water. It was as if from *Queen Mary's* rail, on some Atlantic crossing, you might behold a glistening city lift itself from ocean's depths.

Seconds later we looked down on the elevated railroad circling the Loop, pounding heart of this monster city.

There was the 43-story Board of Trade Building—topped by the figure of Ceres, goddess of grain—where at 9:30 every morning a bell clangs to open the big grain market, shouting brokers buy and sell, and tickers flash to distant farmers news of changing prices (page 833).

In another minute we were over spreading Union Stock Yards, host last year to 6,650,000 cattle, horses, hogs, and sheep. To this world's greatest sales pen trains roll in from all over the Midwest, helping make Chicago the busiest railroad center ever known. In and out of it passenger trains run at the rate of one a minute, and every day some 45,000 freight cars hit its busy switches.

One of Earth's Great Producing Areas

On a map of the North Central United States, published with this issue of the National Geographic,* you can see how rails, highways, rivers, and canals link Chicago with such other busy Midwest cities as Cleveland, Indianapolis, Milwaukee, Minneapolis, St. Louis, Kansas City, Topeka, Lincoln, Omaha, Sioux Falls, and Des Moines (page 850).†

The map shows how, by the Mississippi River and connected inland waterways, cargoes of wheat ride from Minnesota down to the South, and southern oil or sugar goes upstream to Omaha or Minneapolis. In waterborne commerce with ports as far away as Houston, Texas, the Chicago Harbor District, using the canal that connects Lake Michigan with the Illinois River, moves about as much freight as passes through the Panama Canal.

As for air mail and air travel, there's hardly a sizable town from Ohio out to North Dakota or from Wisconsin down to the Missouri Ozarks but has its airport or is in easy reach of one.

It takes these many trains, planes, trucks, and barges to handle Midwest commerce because, mile for mile, State for State, no equal area on our planet yields such farm wealth. Its industrial wealth is also enormous.

Consider our Corn Belt alone (page 839). It reaches west from central Ohio, takes in most of Indiana and Illinois, parts of Missouri, nearly all of Iowa, and parts of Kansas, Nebraska, South Dakota, and Minnesota. This almost level area is more intensively cultivated than any other of its size in the entire Nation.

Where Tall Corn Turns to Meat

Nature made Iowa one big cornfield. Climate, depth and richness of porous soil, and quality of seed bring average yields of 50 or more bushels per acre, and record crops up to 150 bushels. This corn is mostly fed to stock and sold as meat.‡

With 93-percent literacy, Iowa is famed for excellence of schools, its experiments in finding new uses for farm products, and, notably, for the work of its State College at Ames in producing better pigs. It leads all States in corn, oats, hogs, and eggs.

In value of farm products, Iowa runs nip and tuck with California; first one's ahead, then the other. Texas *raises* more cattle, but more are fattened in Iowa than in any other State.

But you have only to look at costly farm machinery, fat, sleek stock, well-painted houses and barns, fine roads, and all the shiny automobiles to see what good country life this Corn Belt puts in reach of farmers who mix brains with sweat.

Nor does Iowa, or any other Midwest State, think only of plows, cows, pigs, hens, and manure. Des Moines, for example, sometimes called America's farm capital, is noted for its farm papers, for J. N. ("Ding") Darling's protect-our-wildlife cartoons in the *Register*, and for its share in making or selling some of the washing machines, fountain pens, cosmetics, farm implements, lawn mowers, vending machines, and railway equipment which Iowa produces.

* Members may obtain additional copies of the new map of the North Central United States (and of all standard maps published by The Society) by writing to the National Geographic Society, Washington 6, D. C. Prices, in United States and Possessions, 50¢ each, on paper; $1 on linen; Index, 25¢. Outside United States and Possessions, 75¢ on paper; $1.25 on linen; Index, 50¢. All remittances payable in U. S. funds. Postage prepaid.

† See "Illinois, Crossroads of the Continent," by Junius B. Wood, National Geographic Magazine, May, 1931.

‡ See "Iowa, Abiding Place of Plenty," by Leo A. Borah, National Geographic Magazine, August, 1939.

Al Mosse from Chicago Sun

One Kind of "New Look" on Chicago's Wind-swept Michigan Avenue

Papa holds his hat, his groceries; chill winds balloon his breeches. Giggling, the girls face the blast. Always the Windy City wishes Nature would spread her weather out a bit and save some of her cool breath for those scorching summer days when all Chicago swelters.

Iowa-written novels, such as Phil Stong's *State Fair,* are graphic studies of Midwest rural life. The same scenes could as well have been laid in Missouri or at an Indiana fair.

Recognized today as foremost painters of Midwest America are the late Grant Wood and Thomas Hart Benton. Wood, an Iowan, took his painter's text from farm life, as one sees in his "Spring in the Country," "Popcorn for Grandpa," or that now famous picture of what he called "good and solid people," his "American Gothic." For it Wood's sister and a Cedar Rapids dentist posed.

Benton's Jesse James study and other murals in Missouri's capitol at Jefferson City lure thousands of sight-seers every year, though over them two schools of Missouri thought forever argue.

Omaha, Nebraska, is only 125 miles west of Des Moines; but trees get scarcer, hills rougher, and houses farther apart as you near the Missouri River, beyond which begin the Great Plains.*

Metropolis of the Nebraska Plains

This Nebraska metropolis is much like Chicago, especially in its stockyard's chorus of bleats and bawls, its eager interest in daily quotations on grain and livestock prices, and its big flour mills. If you don't care for the scent that hints at meat-packing plants, there's an olfactory antidote in the appetizing fragrance of fresh bread, cookies, and doughnuts from many bakeshops.

Train riders gasp at the architectural beauty of Omaha's sumptuous Union Station. Transients go for big thick steaks at the Paxton or Fontenelle Hotels, struggle for elbowroom on crowded dance floors, listen to cowboy guitar players strum "A Home on the Range," or applaud a pint-sized brunette dressed

* See "Nebraska, the Cornhusker State," by Leo A. Borah, National Geographic Magazine, May, 1945.

Staff Photographer J. Baylor Roberts

Brokers Shout and Gesticulate in Chicago's Howling, Uproarious Wheat Pit

With hands outstretched, members of the Board of Trade offer to buy or sell. Palm in or out, with one or more fingers extended, shows whether a broker is buying or selling and indicates the price in fractions of a cent. From a balcony visitors may look down on the pandemonium of big days when prices soar or break. Grain prices here are flashed throughout the world (page 847).

Indian girl style who gets up to hum "My Little Mohee."

Once a year everybody gets all steamed up over spectacular carnival frolics of the Knights of Ak-Sar-Ben, a word coined by spelling Nebraska backwards.

From Omaha you can hop a Mid-Continent plane for Minneapolis. Take a side trip west from Huron, South Dakota, by all means; it's worth it, to see the great stone faces carved on Mount Rushmore, near Rapid City, or to ride through the amazing Badlands.*

Land of Lakes, Bread, Butter, Iron

The 2,700-mile-long Missouri winds its muddy way through both North and South Dakota, States famous for spring and durum wheat. There's corn, too; and vast potato patches, oats, rye, barley, flax—and, as always on the grassy plains, wind-swept cow ranches.

Minnesota, "Land of 10,000 Lakes," is a summer playground for vacationists from all over the Midwest. Even before the Civil War, southern planters, bringing their families and their slaves, used to come up the Mississippi by steamer to summer around St. Paul. Three great river systems, the Mississippi, the Red River of the North, and the now much-discussed St. Lawrence, all rise in Minnesota.†

Here, too, is still more food for that big "Breadbasket"—corn, wheat, rye, barley, potatoes, and meat from packing plants. Remarkable, too, is the growth of Minnesota dairy-farm cooperative marketing.

The Twin Cities, St. Paul and Minneapolis, stand at the head of Mississippi River navi-

* See "South Dakota Keeps Its West Wild," by Frederick Simpich, NATIONAL GEOGRAPHIC MAGAZINE, May, 1947.

† See "Minnesota, Mother of Lakes and Rivers," by Glanville Smith, NATIONAL GEOGRAPHIC MAGAZINE, March, 1935.

Carnegie-Illinois Steel Mill and Youngstown Sheet and Tube Works on Calumet Harbor

Morris Aerial Survey

Ore Boats from Lake Superior Unload in Calumet River, Part of the Illinois Waterway

Staff Photographer J. Baylor Roberts

Everything from Furniture to Frocks Is Displayed in Chicago's Merchandise Mart

Here a buyer from Texas, on one of the 400,000 buying visits made annually to the Mart from all over the United States, is fingering a temptingly modeled frock. More than 450 different lines of apparel and accessories for women, children, and infants are on permanent display. But articles ranging from hammocks to home freezers, ties to toys, may be found in this huge institution, which has a "population" of 25,000 people and in size is equal to eighteen 20-story buildings all under one roof.

gation, 1,830 miles from the Gulf and near the geographic center of North America.

Though once miles apart, the Twins have spread out so much that now it's not easy for a visiting stranger to be quite sure which town he's in.

Today the narrow Mississippi winds happily through downtown Minneapolis and past elevators, flour mills, and the University of Minnesota.

To a singular degree, development of the Northwest's mines, lumber mills, wheat fields, and transport has spread from the Twin Cities.

From here James J. Hill built his Great Northern Railway out to the Pacific coast, whence his great steamers also once plied to the Orient. Opening of new fruit and wheatlands all across the Northwest followed the building of this long line.

Hill was to Northwest rails what the Weyerhaeuser family was and is to lumber, and what the Washburns, the Crosbys, the Pillsburys, and the Harry Bullises are to Minnesota flour milling; General Mills, Inc., of Minneapolis, is now the world's largest grinder of wheat.

Duluth, at the most westerly tip of Lake

Superior, stands near the point where John Jacob Astor built a fur-trade post in 1817.*

Though far off beaten tracks of cross-continent trippers, Duluth-Superior Harbor ranks second among United States ports in total domestic and foreign water-borne commerce, being surpassed only by New York. About 7,000 vessels of all kinds arrive and depart each season.

Hills of Rust-red Ore

More than 60 percent of the iron ore mined in the United States comes from the Mesabi, Cuyuna, and Vermilion Ranges of Minnesota and goes by ore boat to steel mills about Chicago and elsewhere.† In one busy year the Lake Superior district shipped more than 92,000,000 tons!

Wheat, too, leaves this harbor in oceanic volume; 25 grain elevators can hold 50,000,000 bushels. At 20 bushels an acre, that's the crop from a field of some 2,500,000 acres!

What may happen to foreign trade from "the head of the Lakes" to Buffalo if and when the St. Lawrence Seaway Project is completed is a subject now of much debate in all these Lakes cities.

Just now, it's interesting to imagine ships docking here from South America, or even from China, and passengers for Antwerp or Capetown waving farewell from a liner's rail as she edges away from a wharf, say, in Milwaukee or in Port Arthur, Ontario!

Though even few people in Chicago seem to know it, several small ocean-going freighters of Swedish-American and three other lines already use the St. Lawrence between the Windy City and North Sea ports. They bring us wood pulp, canned fish, herring, cod-liver oil, and tulip bulbs, and take back meal, flour, and farm implements.

Many Blonds and Scandinavian Names

All this Minnesota and Dakota country suggests Scandinavia; look at all the blonds, and the Danish, Norwegian, and Swedish names in telephone books!

Likewise in Wisconsin, as in St. Louis, Cincinnati, and other Midwest "racial islands," German names abound. Many early orchestras, athletic and glee clubs, learned societies, and newspapers were founded by German immigrants. But it was the French who came earliest.

Father Marquette and Jolliet were the first whites to land at what now is Chicago. For years St. Louis was strictly a French settlement; the French left other place names, such as De Pere, Eau Claire, Ste. Genevieve, but they faded from the Midwest as permanent settlers. What might be filling this Breadbasket today had pioneer French remained to rule the Mississippi Valley?

After the French and Indian War, the Revolution, and the War of 1812, migrant American tides rose and flowed through Cumberland Gap, down the Ohio, up the Wabash, the Illinois, the Missouri, as in the days of Daniel Boone, Simon Kenton, and the fur trappers. So many from Virginia settled in southern Indiana and parts of Missouri that to this day these sections have a distinct flavor of southern speech, culture, and social behavior.

Poles, Irish, Italians, Greeks—by hundreds of thousands they too now flavor the Midwest melting pot. But few take to the land; the mines and the great industrial centers chiefly absorb them. Even the oil fields of Indiana, Illinois, and Kansas are worked mostly by Americans of Anglo-Saxon origin.

The Yield of Wisconsin

What a pile of good things to eat Wisconsin dumps into our Breadbasket! ‡ Besides grain, it adds butter, cheese, milk, potatoes, sugar beets, peas, maple syrup, cherries, cranberries, apples, and plums. It ranks high in growing dairy cattle and yields hemp and cigar-wrapper tobacco.

Tractors, farm machinery, footwear, textiles, sawmills, motor-vehicle parts—Wisconsin makes them all.

Big paper mills abound. In the State are such factory centers as Milwaukee, with the great Allis-Chalmers plant; also Racine, Kenosha, Janesville, Beloit, and Madison with its famous laboratory for the study of wood and wood products.

With 85,000 miles of highways and 7,000 miles of railway, Wisconsin's scenic regions, similar to Minnesota's, are reached by hordes of summer guests.

At railway terminals in all these bigger Midwest cities you see sleek, swanky new Diesel-electric locomotives lined up side by side, painted like circus wagons. There they stand, as passengers climb aboard the streamlined aluminum-and-steel coaches, ready to whiz across the Breadbasket or race on to New York, New Orleans, or the Pacific coast.

* See "The Romance of American Furs," by Wanda Burnett, NATIONAL GEOGRAPHIC MAGAZINE, March, 1948.

† See "Steel: Master of Them All," by Albert W. Atwood, NATIONAL GEOGRAPHIC MAGAZINE, April, 1947.

‡ See "On Goes Wisconsin," by Glanville Smith, NATIONAL GEOGRAPHIC MAGAZINE, July, 1937, and "Deep in the Heart of 'Swissconsin,'" by William H. Nicholas, June, 1947.

Chicago Tribune

Big Day for Big Boy and His Master, Claude Millwee, of Fort Cobb, Oklahoma

Big Boy, the steer in front of the lad proudly holding his trophy cup, is his prize-winning grand champion, exhibited in 1947 at Chicago's International Livestock Exposition. That fat bovine sold at auction for $8 a pound, bringing young Millwee, a member of the Future Farmers of America, the snug sum of $8,800 (page 843)

Staff Photographer J. Baylor Roberts

From Textbooks to Tassels! Schoolgirls Take to the Cornfields and Help Pollinize Hybrid Seed Corn near Yankton, South Dakota

"It's hot, but it's healthy." Cornfield vacations bring these schoolgirls tan and spending money in return for pulling tassels from rows of one kind of corn and causing its ears to be pollinated by tassels of another type in two adjacent rows. This hybrid-seed cornfield belongs to Gurney Seed & Nursery Company.

Acme

Vigorous, Squirming Boys and Girls Hold Still to Paint a Cowboy or a Princess

In Winnetka, Illinois, schools the child is free to set his own pace in learning. Creative art work as shown above is encouraged by field trips into the woods during which youngsters may stop to sketch. Building self-reliance is basic training in this type of progressive teaching.

What fancy names! The Zephyrs, Rockets, Hiawathas, Four Hundreds, Humming Bird, Super Chief, Capitol Limited, City of San Francisco, Empire Builder, Twentieth Century Limited, Broadway Limited, Panama Limited.*

Like long red-and-yellow centipedes they race across the Great Plains and storm the mountain passes. Cowboys tell us that on still nights they can hear a streamliner's hoarse horn 10 miles away.

Many such new-type locomotives are built by General Motors at its plant in La Grange, Illinois, near Chicago. I saw some "launched."

No man-made land animal has such power. One freight Diesel-electric easily hauls 140 loaded cars; it could haul more, were it not that couplings would break and the train pull in two. More than 5,000 of these giants are now in use.

Every day the La Grange plant turns out an average of five units; a "unit" is a single car. A typical locomotive is four such units coupled together; it is 200 feet long and has 32 driver wheels.

A 6,000-horsepower freight locomotive costs about $550,000. "And nobody knows how long one will last," said a GM engineer. "Many have run more than 1,000,000 miles without major repairs. One passenger locomotive, on the Denver Zephyr, has run 3,750,000 miles—which makes it the world's most traveled land animal."

That "Train of Tomorrow," shown all over America, was built here and at the Pullman shops. Its "astra dome" sight-seeing section, set up on each car's roof, is reminiscent of the blister on a bomber where the top turret gunner sits.

Most Pullman cars used in America—and thousands of freight cars—are built at Pull-

* See "Trains of Today—and Tomorrow," by J. R. Hildebrand, National Geographic Magazine, November, 1936.

Staff Photographer J. Baylor Roberts

Color and Design Artists Turn ■ New Dining Car into an Art Gallery

Most of the sleepers, club, and dining cars used in America are built in Chicago by Pullman-Standard Car Manufacturing Company, which also builds thousands of freight cars and hundreds of streetcars and trolley coaches. Ralph Haman, seated, is the company's engineer of color and design. He and Everett Lee, assistant foreman, are discussing murals and decorations for 48 new cars ordered jointly by the St. Louis-San Francisco Railway and the Missouri-Kansas-Texas Lines. This diner, one of them, is for use in a crack train, the Texas Special.

man, Illinois, within the city limits of Chicago. The first "palace" car ever built, the Pioneer, was used after Lincoln was slain to bring his body from Chicago to Springfield. Some of the first sleepers and dining cars used in regular service on railways in Great Britain were built by Pullman and shipped abroad.

Factories Flourish in Illinois Cities

Nearly every Illinois city, even the smaller ones, has some kind of industry.

Decentralization slows down the tide of boys who used to head for Chicago or St. Louis. Elgin makes watches; Rock Island and Moline make farm implements; Decatur has soybean mills; Peoria makes whisky and tractors; Joliet has its wallpaper mills; and Kewanee makes boilers. So it goes.

Springfield, State capital, has its memories of Lincoln, and its memorials to him. Of this home town of his, he said, when leaving for the White House: "To this place, and the kindness of this people, I owe everything."

Since mound-builder days Illinois has been a good farming country. Pioneer whites sent river flatboats to market loaded with hams, wheat, whisky, salt beef, beans, and tobacco.

Men early found this sticky prairie sod hard to till; that hastened the invention of steel plows and other farm machinery. Today light tractors are displacing horses and mules, and mechanical corn pickers save wear and tear on farm hands.

Since whites got their first seed from Indians, corn here has been the main crop. As in Iowa, it is nearly all the hybrid type.

The soybean crop in Illinois is twice that

Fred G. Korth

"No Left Turn," "No Parking at Any Time," No Elbowroom at Rush Hour in the Loop

Chicago's busiest intersection is the corner of State and Madison Streets. At times the jam is terrific, especially when children swarm to watch a pet elephant, with a rubber stamp in his trunk, "autographing" an animal book at Marshall Field's seething bazaar. Like some other U. S. cities, Chicago, with nearly 5,000,000 people, has a puzzling downtown transportation problem. The new subway being built will help some.

in any other State. Milk, cheese, livestock, and enormous stacks of breakfast food, flour, starch, and corn products help fill the Basket.

McCormick and His Reapers

More than any other State, Illinois has helped develop farm machinery.

When Cyrus Hall McCormick couldn't sell his newly invented reapers in Virginia, he came west.

Here in Illinois he found men, women, and children wearily cradling wheat even by moonlight, to save a crop that ripens so quickly. He sensed that from Ohio westward must rise the granary of the Nation. So he built a reaper factory in Chicago.

As the wheat crop spread west, McCormick built assembly plants in other Midwest cities. He gave credit, or reaper agents took grain for pay. An annual "field day" grew up, with grain-cutting contests; farmers chained two reapers together and pulled in opposite directions to see whose machine would break apart first.

In foolish pioneer feats of wild exhibitionism, they even tried to mow down patches of saplings!

By 1884 McCormick had sold nearly 55,000 reapers—the dawn of farm-machinery mass production. Slowly competition reduced the number of rival companies.

Five of those still in existence in 1902 organized as a single unit and took the name of International Harvester Company. Besides modern combine harvesters, they make plows, cultivators, binder twine, planters, hay balers,

motor trucks, corn and cotton pickers, road machinery—dozens of labor-savers to handle food crops faster.

From the Midwest's old-time country fairs, with trotting races and displays of fat pigs, big bulls, and prize-winning hens in "cackle berry" contests, came such now-famous shows as Kansas City's "Royal" and the International Livestock Exposition at Chicago.

I saw the latter in 1947, when 12,500 fine animals took part. For them it is like an Atlantic City beauty parade (page 838).

With ribbons in their tails, high-stepping horses proudly pull shiny buggies driven by haughty women in mink coats. Jumpers go gracefully over the bars or nick one with a careless hoof. Sheepshearers work like sculptors hewing marble; they clip away natural curves, leaving little baa-baa squared off into a cube of snowy wool.

Dead-pan judges tie blue badges on broad-beamed bulls admired even by kilted cattle fanciers from Scotland. Prizes go to hogs too fat to stand.

From boxes, owners and guests clap and cheer a shapely heifer while the band plays on. Chicago, too, exalts the golden calf.

I met exhibitors here, old friends, from as far west as Cheyenne. Iowa, Missouri, Illinois, Texas, Indiana, all were here, including crowds of 4-H Club boys and girls.

I helped entertain a Hoosier delegation—maybe I feel close to them because my mother's Scottish parents settled early in Indiana. One of her girlhood memories was of the Chicago Fire of 1871, when smoke and the smell of burnt wood drifted as far south as Terre Haute and beyond.

Versatility of the Hoosiers

Hoosiers not only write poems and novels, play fiddles, and race cars on the Indianapolis Motor Speedway; they make some of the world's finest fishing tackle and brass band instruments.*

Despite that Bible warning, they also built a great city on the sands. That's Gary; with giant steel mills, it has been called "America's most powerful concentration of industry."

Here beside Lake Michigan, on swampy sands and dunes, Hoosiers pumped enough silt from the lake's bottom to lay a 15-foot blanket over many thousands of acres; then, on additional acres, they hauled in trainloads of black soil, set out shrubs, trees, gardens, and built homes, schools, churches.

Though Indiana has no active iron mines, she imports so much ore that steelmaking is her biggest industry. Here at Gary rise the tall smokestacks of U. S. Steel, Republic Steel, and many allied groups making sheets, rails, bolts, springs, tin plate, etc. The Carnegie-Illinois mill alone covers 1,400 acres.

As more and more iron ore came south by lake boat from Michigan and Minnesota, more steel mills rose in this area, spreading west to Whiting, East Chicago, and Hammond, known now as the "Cities of the Calumet." This area ranks second only to the Pittsburgh-Youngstown district in production of ingots. You see here how our industrial power tends to move westward (pages 834-5).

But the moon still shines bright along the Wabash; there's still that scent of new-mown hay. Hog and hominy is still good Hoosier fare, and if you'll go down to the Indianapolis stockyards some summer morning about 4 o'clock you'll see trucks rolling in from every direction, bringing fat hogs and beeves. Some of earth's most succulent hams and bacon are cured right here (page 849).

Indianapolis, Hub of Hoosierland

As our map shows, railroads and highways run out from Indianapolis like the spokes of a wheel. This is the largest American city not built on navigable water. It proves how highly industrialized the Midwest has become.

Among the Nation's larger manufacturing corporations which have plants here are General Motors, Swift, Armour, U. S. Rubber, Western Electric, American Can, RCA, Borden, Coca-Cola, and International Harvester.

Factory output of insulin, animal serums, saws, chains, and inner tubes is enormous.

Some of James Whitcomb Riley's lines make Hoosiers sound like indolent, carefree folk, like "Hoosier Hot Shots" on the radio.

Don't be misled! Housewives who make jam know about those glass fruit jars made in Muncie. The Studebakers were making wagons for our Army and for British use in the Boer War long before they built motorcars.

Interesting people may be the chief product. I don't mean just that "Irish" football team at Notre Dame. General Lew Wallace, Theodore Dreiser, Ernie Pyle, Booth Tarkington, George Ade, Meredith Nicholson—they were Hoosiers. So are Kent Cooper, George Jean Nathan, Byron Price, Elmer Davis.

In the Brown County hills in "Abe Martin" country, painters are thick as pawpaws in September.

Vincennes, on the Wabash, is the oldest Hoosier city. Catholic priests in its historic church showed me documents dating from French times. Great Britain got Vincennes

* See "Indiana Journey," by Frederick Simpich, National Geographic Magazine, September, 1936.

Fred G. Korth

In Chicago's Lincoln Park Zoo, Bushman, 550-pound Gorilla, Munches Grapes

Born in the French Cameroons, Bushman is now 20 years old. He eats 22 pounds of food a day: fresh vegetables, melons, fruit, bread, and malt extracts—no meat. He gets a shower bath every other day. Largest of manlike apes, 15 of these monsters are in captivity today in the United States.

from France after the French and Indian War. Later came that tug of war between Virginia and the British. To stop the latter from keeping a toe hold in this West, Virginia sent George Rogers Clark with 350 lanky, squirrel-gun Virginians, who after two trials took the old fort.

Vincennes in 1800 was the first capital of Indiana Territory. Here now is the imposing George Rogers Clark Memorial, which looks a bit like the new Jefferson Memorial at Washington. Also, here's one of the most graphic monuments ever erected to Lincoln; it's a plaque at the end of the Lincoln Memorial Bridge over the Wabash and shows him walking bareheaded, carrying a stick, on his journey through Vincennes in 1839.

Paper—100 Carloads a Week

Bobbs-Merrill, the publishers, have their head offices at Indianapolis.

At a huge plant in Crawfordsville the *Encyclopædia Britannica* is printed, in a branch of R. R. Donnelley & Sons Company.

Donnelley's Lakeside Press in Chicago runs day and night. More than 100 presses, including giant color machines as crowded with moving parts, lights, and wires as a Navy

Staff Photographer J. Baylor Roberts

A Mirror Doubles the Eye Appeal of Appetizing Food

There's cold ham, roast beef, meat loaf, liver sausage, salami, and liver cheese. This is a mouth-watering scene in a home demonstration kitchen of Swift & Company's great Chicago plant. Guests seated in the auditorium may look up into the overhead mirror and see just how the young woman is fixing the platter.

destroyer, gobble up paper at the rate of more than 100 carloads a week.

Jobs include more than 50,000,000 catalogues a year for mail-order houses; telephone directories for Chicago and many other Midwest cities, and some 40,000,000 copies a month of national weeklies and monthlies. Lakeside also prints tons of Bibles, schoolbooks, and other editions.

Printing Mail-order Catalogues

America's catalogue-printing business beggars belief. Montgomery Ward's catalogues use up 222 carloads of ink a year. Its largest catalogue alone for one year, not counting smaller ones, would make a stack 256 miles high!

At Ensenada, on Mexico's west coast, the postmaster once told me he spent most of his time helping buyers write out money orders on Chicago and sorting out parcel-post bundles when the goods arrived.

Sears is the biggest mail-order house, though it really sells much more through its retail stores, some of which it has built in Latin America.

But Ward's is the older. I looked at its first catalogue, printed in 1872. Hollywood,

Kosti Ruohomaa from Black Star

Here Customers Study Changing Tides of Market-bound Hogs, Cattle, and Sheep

This big board in Kansas City's Livestock Exchange Building is about 20 feet long by 10 feet high. Chalked up as reports come in are receipts of all classes of meat-bearing animals at the Nation's principal livestock markets, and up-to-the-minute reports on developments at these great on-the-hoof meat markets. The information is posted by employees of Production and Marketing, Livestock Branch, U. S. Department of Agriculture.

and artists across America, prize these old catalogues, from which to copy early styles in clothing, vehicles, etc.

In 1875 a man could order a 6-cent shaving brush, or an all-wool overcoat for $4.50! A girl could get a "bustle with 3 springs" for 15 cents, or a good sidesaddle for $4.85. From the 1948 catalogue a modern miss may choose a $7,000 diamond ring.

Beautiful girls who model dresses for Ward's catalogue pictures bring floods of fan mail asking names and addresses. One enamored soldier wrote, "I'm sure that's my long-lost sister on page —. Where can I write her?"

Every one of these larger Midwest cities is a distributing point.

Kansas City and St. Louis are both the homes of jobbers who ship "package cars" of goods as far away as Texas. Lighter goods go by air express to the Pacific coast.

Mighty Mart of the Midwest

Chicago's famed Merchandise Mart seems a cross between a Damascus bazaar and that once-busy sample fair at Leipzig. It has 93 acres of floor space, all under one roof; it could hold everybody in Chicago! You can window-shop through 7½ miles of air-conditioned streetlike corridors. It rents space to exhibitors.

Nothing is for sale. You order from samples. Delivery may be from any factory between Boston and Los Angeles.

Here a buyer from Buenos Aires or Baltimore—or Blue Eye, Missouri—can usually find what he wants without running all over America hunting it (page 836).

To haul all samples shown here would take a train 17 miles long. It would be loaded with infinite goods, from lamps, carpets, furniture, clothing, china, glass, and curtains to pottery and toys.

In 1947 this, our second largest city, held 946 conventions. They make hotel rooms hard to find. When machine-tool makers held a show, 175,827 buyers registered from 34 different countries!

Political parties like to hold their national conventions here. Since Lincoln was nominated, Chicago conventions have named a long list of Presidential candidates.

One of earth's three chief financial centers, Chicago has 68 banks with total deposits of more than eight billion dollars. Two of these, the First National Bank of Chicago and the Continental Illinois National Bank and Trust Company, are among the seven largest in the United States.

Our Daily Bread—and Food for Europe

To many American farmers, the Chicago Board of Trade's wheat pit is the most significant spot in the whole Midwest. It interests you and me, too, because of the effect of prices here upon what we pay for a sack of flour. The Board itself doesn't buy or sell; the members do that.

Pioneer farmers hauled corn and wheat to town and sold for what they could get; 250 miles away, prices might be higher or lower, depending on nearness to a flour mill, drought, floods, or other factors.

Wagon trains of grain rumbled into early Chicago.

One day in 1848 swearing bullwhackers cracked their black-snake whips over grunting oxen yoked to heavy wagons that bogged down in Chicago's muddy lanes. They halted, finally, before a rough wooden building at the corner of Clark and Water Streets—Chicago's first Board of Trade.

Now, 100 years later, figurative mountains of wheat and corn tumble through this most gigantic of all grain exchanges. Here Uncle Sam buys hundreds of shiploads of wheat for European relief; private dealers sell to ports as far away as Singapore.

If you run a flour mill, starch or breakfast food factory, or corn syrup works, or export wheat, you can buy here for "cash" and get quick delivery from cars already on Chicago sidings.

To deal in futures or to hedge, members go down to one of the five pits on the main floor of the Exchange and join other yelling, gesticulating brokers.

To gallery spectators it all looks mad. But every hand held up, palm in, palm out, one finger up, two, three, is a signal for a bid to buy or an offer to sell, and indicates at what price. You soon catch on (page 833).

Home-town Papers Mirror Midwest Life

But more than thoughts of wheat prices and farm and factory problems engages the Midwest mind. Its people are interested in each other, especially folks in towns and smaller cities. Nearly every family takes at least one big-city daily; but it's the home-town paper they read first, and most closely. They want to see what the other fellow is doing.

Country weeklies and biweeklies flourish by the hundreds. Minnesota alone has between 400 and 500.

Many rural editors gain State-wide fame. I know several whose amusing paragraphs are steadily picked up by big dailies.

Ed Howe, "Sage of Potato Hill," who long edited the Atchison, Kansas, *Globe,* was known across America. In the same column he'd mix want ads, jokes, gossip, and personals. To hold readers, he once told me, "You have to make 'em laugh, make 'em cry."

In His Steps, by that prolific writer Charles M. Sheldon, gained a circulation in the U. S. larger than that of any other book except the Bible. In his Topeka home the Reverend Mr. Sheldon once showed me a whole shelf of these books—I think it was more than 30! —each translated into some foreign language.

Sheldon didn't know how many copies his book had sold; he thought about 18,000,000, here and abroad. Other estimators say about 25,000,000.*

William Allen White walked with kings. His *Emporia Gazette,* printed in a little Kansas town, was his great love. Though national magazines bid for his articles and great eastern dailies tried to hire him at many times what he might earn on his small Kansas daily, he preferred that life.

White could and did "take the hide off" Kansas when he had a crow to pick. Usually the Jayhawkers chuckled; always they started thinking.

Once White took me to a Rotary luncheon in Emporia; with us went a preacher, a photographer, and a drygoods salesman. A bit later I saw my Kansas friend in Washington,

* See "Speaking of Kansas," by Frederick Simpich, National Geographic Magazine, August, 1937.

Paul Dorsey from Ford Motor Co.

What Myriad Trees We've Cut since Pilgrim Fathers Built Their Houses!

Once much of the Midwest was woods. Sawmills and paper mills still hum in Wisconsin and Minnesota, but vast forests the pioneers knew have vanished; Chicago alone consumed many. Hundreds of early towns were nearly all built of wood. Farmhouses, telephone poles, railroad ties, bridges, block pavements, fuel, all took toll and left desolate leagues of stumpage. Now trees are better husbanded, as on this timber property of Ford Motor Company in Michigan's Upper Peninsula.

on his way to the White House because the President had sent for him.

Such men, perhaps more than editors of big dailies, reflect the intimate home life of this Midwest.

Mid-America on the Move

Relations between States in the Midwest group, close because of good roads and easy riding, are brought closer too by football games, hunting trips, horse shows, field trials for bird dogs—and the endless conventions.

In Europe a car might be stopped by border guards two or three times in the distance it takes a Kansas family to drive to a football game.

It's always a big noise when the Tigers of MU—Missouri University—battle over the cleat-torn turf with their friendly enemies, the Kansas Jayhawkers, or when Nebraska bucks the Minnesota line, or the Green Bay Packers meet Chicago at Wrigley Field.

Glee club singers, basketball teams, and intercollegiate debaters all warm up this kaleidoscopic picture of restless life in the Breadbasket.

If an Illinois plow salesman goes peddling in Kansas, he may marry some wheat farmer's daughter, just as a Kansas City clerk courts in Omaha or Joplin Jane finds a mate in Minnesota.

When Chicago was burning, St. Louis sent a special train carrying firemen and their engines. In Missouri country schools, at our Friday "declamations," we used to recite a poem about that.

Between St. Louis and Chicago, business ties have long been close. Yet St. Louis is so different! It resembles Baltimore in its social aloofness, its indifference to booms, its distinctive culture.

St. Louis, Mellow and Leisurely

Elderly, leisurely St. Louis had its philosophical societies, its clubs, and its excellent concerts when Chicago was yet a brawling pioneer maelstrom of mud, pine shacks, and get-rich-quick land gamblers.

I was reared in Missouri.* I have slept in many an old home built by slave labor; I

* See "These Missourians," by Frederick Simpich, National Geographic Magazine, March, 1946.

J. C. Allen and Son

Mamma Sow Smiles as Her Brood Make Hogs of Themselves

It looks as if "plates were laid for eight," but the Berkshire children are so mixed up it's hard to count them exactly. Under the third from left protrudes the stern of a ninth one. Anyway, this happy pig picture shows no sign of "child spacing" or "planned parenthood" in Hoosier hog circles. Somewhere in Indiana.

have hunted coons, played ball in many towns, lived on the old "plank" stage road across Howard County, heard old-timers defend Jesse James or tell how Quantrill's "border ruffians" raided and burned Lawrence, Kansas.

For a few dizzy weeks I worked as advance agent for a road show that played many Midwest cities. *All* are good ways to learn human geography in any land!

So I know it's wrong to say, as hurried visitors may, that "all these Midwest towns look alike." What kin, for example, is Appleton, Wisconsin, with its paper mills, to Hutchinson, Kansas, with its salt mines and seas of wheat?

Or how does Columbia, Missouri, with its shady streets and classic University buildings, its Stephens and Christian Colleges for women, its fraternity and sorority halls, look like that restless zinc-mining and money-making city of Joplin, only a few hours to the south?

Sure, they all have the same gas stations, chain stores, chain movies, and maybe chain hotels; they read the same comics and columnists and are amused or bored by the same singing commercials. But how utterly different are such cities as St. Louis and Kansas City!

St. Louis makes mountains of shoes, miles of streetcars, enough aspirin to relieve a nation's headaches.

But at dinner, unless you bring up business themes, likely as not talk turns to the Missouri Historical Society, somebody's trip to Argentina, or what Washington may learn from Daniel R. Fitzpatrick's latest cartoon in the *St. Louis Post-Dispatch*.

Kansas City's Growing Pains

Kansas City, younger, still feeling its growing pains, stands on the western edge of the State. It belongs as much, or more, to Kansas wheat, oil, jobbers' trade, or to the cow ranches of Oklahoma and Texas as it does to Missouri (page 846).

It has its research laboratories, seats of higher learning, art school, and William Rockhill Nelson Gallery of Art; but, being young, restless, eager to test new ideas, it *runs* to work, eats and plays golf faster. It can't wait for tomorrow. Yet, like more sedate St. Louis, in its own vital, vigorous way it also helps fill our Breadbasket in this ever-changing Midwest.

The Society's New Map of the North Central United States

THE NEW map of the North Central United States, which reaches the 1,800,000 member-families of the National Geographic Society as a supplement to this issue of their Magazine, is the sixth and last in The Society's series of large sectional maps of the United States.

This series furnishes a full-color reference map of the country equivalent in size to a single sheet more than seven feet by four feet.

Five maps previously published were: Southwestern United States, June, 1940; Northwestern United States, June, 1941; Northeastern United States, September, 1945; Southeastern United States, February, 1947; and South Central United States, December, 1947.*

Five of the six sectional maps are made on the uniform scale of 1:2,500,000, or 39.5 miles to the inch. The densely populated northeastern section required an even larger scale—1:1,750,000, or 27.6 miles to the inch.

Map Shows Nine Midwest States

Within the decorative borders of the new North Central United States map, 28 by 26½ inches, are presented the nine States between the Great Lakes and the Rockies—North and South Dakota, Minnesota, Wisconsin, Nebraska, Iowa, Illinois, Kansas, and Missouri—as well as parts of adjacent States and Canadian Provinces.

Main highways are clearly marked and numbered, elevations indicated, national parks and monuments and principal railways and canals shown.

Lakes Superior and Michigan dominate the northeastern quarter of the map, Fort Peck Dam and Colorado Springs lie along the western border, and Nashville, Tennessee, shows in the southeast corner.

The geographical center of the United States falls within the area of this map—in north-central Kansas, near Smith Center. Almost 600 miles northward is the geographical center of the whole North American Continent—a few miles west of Devils Lake, North Dakota.

Up on Lake of the Woods appears the northernmost point in the United States—the stray peninsula, known as the Northwest Angle, which forms a part of Minnesota, although it is connected to Canada by land and separated from United States soil by water.

Shawneetown, "newest and oldest town in Illinois," is shown in its new location some three miles back from the often-flooded banks of the Ohio River.†

Near Lake Itasca, Minnesota, source of the great Mississippi, visitors can walk across the infant river on steppingstones.

An important base for heavy bombers is now located near Rapid City, South Dakota. Near here, in November, 1935, the intrepid two-man crew of the National Geographic Society-U. S. Army Air Corps stratosphere balloon *Explorer II* took off on its record-breaking flight to an altitude of 72,395 feet.‡

Now from Camp Ripley, 100 miles north of Minneapolis, new plastic balloons called "skyhooks," similar in design to *Explorer II*, carry instruments 20 miles up and float through the skies of the Midwest, gathering data for the Office of Naval Research.

But still the record set 13 years ago stands as the greatest height yet reached by man.

Just east of Kansas City is Independence, Missouri, home town of President Harry S. Truman. In southeastern Missouri the map shows Big Spring State Park, a favorite spot of the President. An enlarged picture taken in Big Spring Park was used in the front panel of the map case presented the President by the National Geographic Society.

Romance of Place Names

Among the 8,927 place names on this map are many familiar surnames. Accordingly, hundreds of American families will find their own name somewhere on the map.

A cheerful note is struck by such place names as Joy, Good Hope, What Cheer, and Fair Play. Hazard and Gravity strike a more somber chord. Many names are picturesque, such as Sleepy Eye, Concrete, Crocus, Young America, and Potato Creek. Eloquent of the Indians are such names as Broken Bow, Spotted Horse, Wounded Knee, Lost Nation, and Badnation.

* Members may obtain additional copies of these sectional maps and the Map of the United States by writing to the National Geographic Society, Washington 6, D. C. Prices, in United States and Possessions, 50¢ each, on paper; $1 on linen; Index, 25¢. Outside United States and Possessions, 75¢ on paper; $1.25 on linen; Index, 50¢. All remittances payable in U. S. funds. Postage prepaid. Also available is an enlarged map of the U. S., 67″ x 43½″, on heavy chart paper, for $2 in U. S. and Possessions; Index, 25¢. Elsewhere, $2.25; Index, 50¢. Postpaid. Mailed rolled to U. S. and Possessions; postal regulations necessitate folding them for mailing to all other places.

† See "Men, Moose, and Mink of Northwest Angle" and "Shawneetown Forsakes the Ohio," both by William H. Nicholas, in the August, 1947, and February, 1948, issues of the NATIONAL GEOGRAPHIC MAGAZINE.

‡ See "Man's Farthest Aloft," by Capt. Albert W. Stevens, in the January, 1936, NATIONAL GEOGRAPHIC MAGAZINE.

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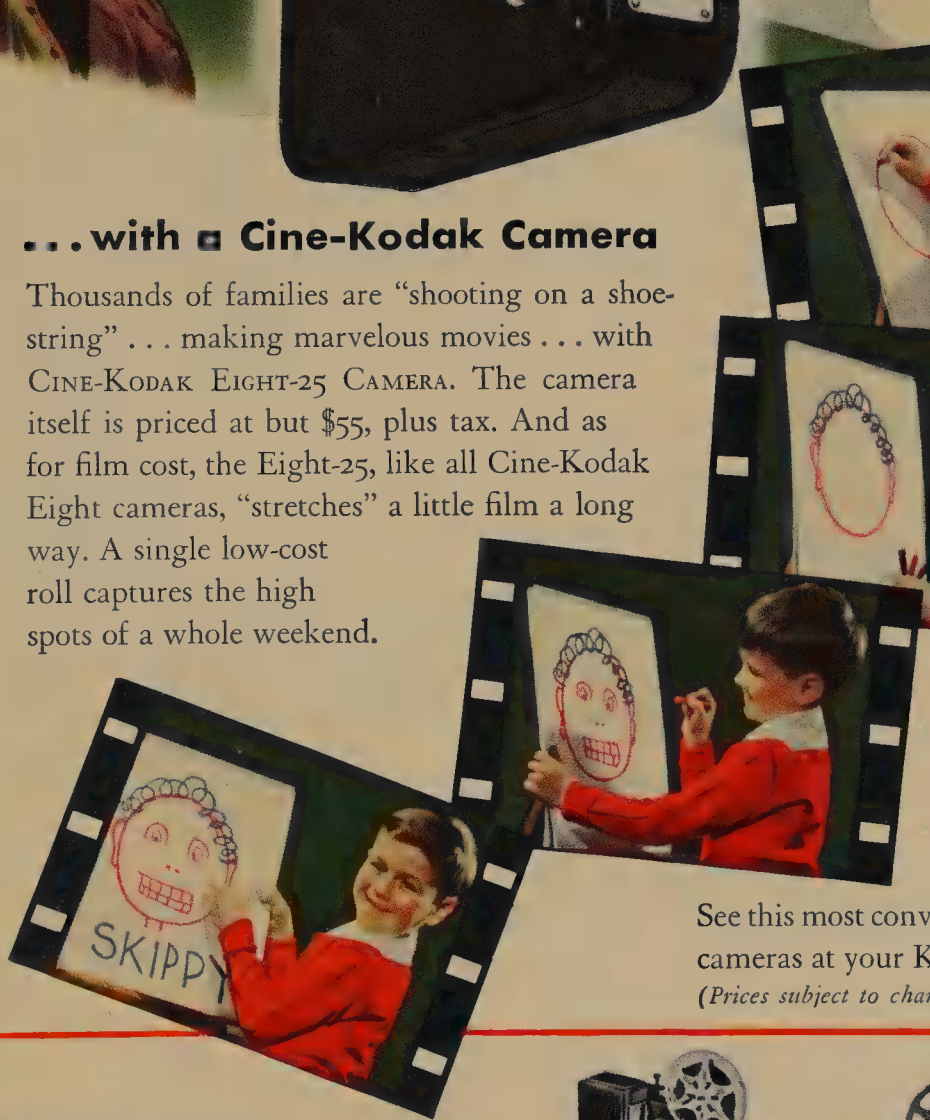

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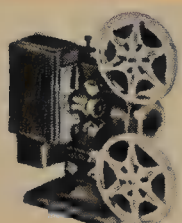

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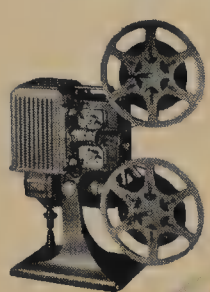

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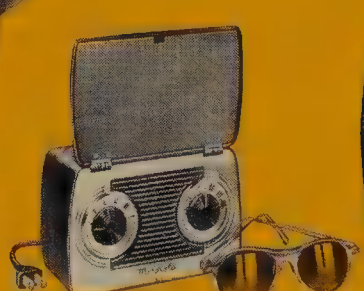

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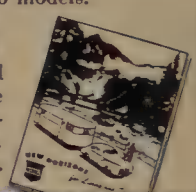

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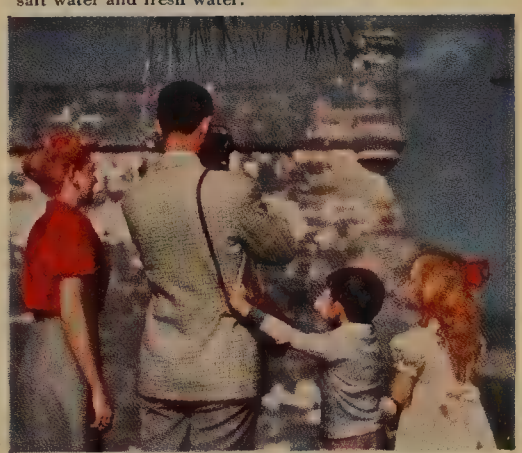

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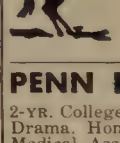

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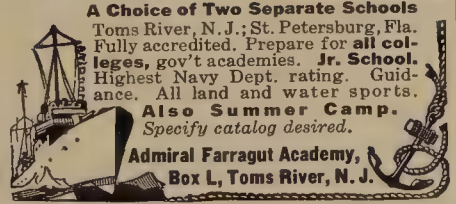

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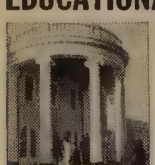

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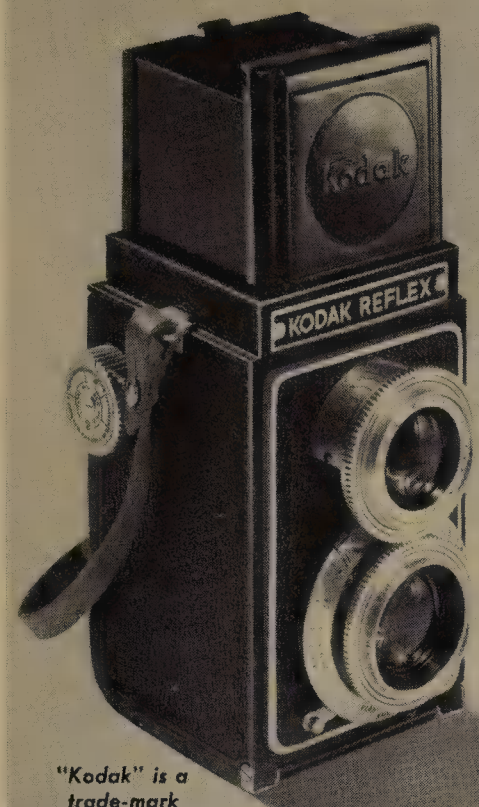

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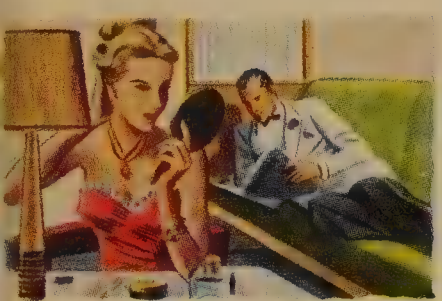
That's the way it happens.

BELL TELEPHONE SYSTEM

Matson proudly announces

the new *Lurline*...finest cruise ship afloat



You cruise in new comfort aboard the Lurline. Staterooms are spacious, beautifully decorated and air-conditioned. Wardrobe closets are large; mirrors, too. One bed folds into a wall, another becomes a sofa to give you a living room by day.

You live in new beauty aboard the Lurline. Public rooms are smartly modern in design...soft pastel colors accented by Polynesian motifs. Here you'll meet new friends, listen to concerts, enjoy the cocktail hour, dance. Here you'll dine superbly.

You can play or relax aboard the Lurline. It's well-equipped for deck games, swimming, resting. Your travel agent will be glad to help you plan a vacation cruise to Hawaii on the new Lurline.

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TO HAWAII

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Baseball is a fast game, yet it's chock-full of pauses. There's the pause before the pitch, the pause between innings . . . and *the pause that refreshes* with ice-cold Coca-Cola all through the stands and bleachers. With so much excitement going on, the little minute for a big rest with a frosty bottle of Coke is so welcome to so many.

Coca-Cola

"Coke"

5

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